Community & Economic
Development Department
www.adcogov.org

ADAMS COUNTY
COLORADO

4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601-8204
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Re-submittal Form

Case Name/ Number: Bennett Creek Gravel Mine / EXG2025-00003

Case Manager: Nick Eagleson

Re-submitted Items:

- [X] Development Plan/ Site Plan
- [ ] Plat
- [ ] Parking/ Landscape Plan
- [ ] Engineering Documents
- [X] Subdivision Improvements Agreement (Microsoft Word version)
- [X] Other: Comment Responses

* **All re-submittals must have this cover sheet and a cover letter addressing review comments.**

Please note the re-submittal review period is 21 days.

The cover letter must include the following information:

- Restate each comment that requires a response
- Provide a response below the comment with a description of the revisions
- Identify any additional changes made to the original document

For County Use Only:

Date Accepted:

Staff (accepting intake):

Resubmittal Active: Engineering; Planner; Right-of-Way; Addressing; Building Safety;

Neighborhood Services; Environmental; Parks; Attorney; Finance; Plan Coordination

BENNETT CREEK RANCH

CONDITIONAL USE PERMIT

PARCEL NUMBERS: 0181500000058 & 0181524200001
ADAMS COUNTY, COLORADO

2nd Submittal Index

LandDesign for Bennett Creek Ranch, LLC
March 12, 2026

Community & Economic Development Department
4430 S. Adams County Pkwy.
1st Floor Suite W2000B
Brighton, CO 80601

RE: Bennett Creek Ranch
Gravel Pit – Conditional Use Permit
PRE-2025-00025

- Adams County Resubmittal Form
- 2nd Submittal Index
- Combined Comment Responses
- Letter of Introduction (Revised) with Operations and Maintenance Plan
- Site Map & Reclamation Map
- Haul Route Map
- DRMS State Mining Permit
- CDPHE Air Quality Permit
- Environmental Studies & Resources Documentation
- Traffic Study – Revised
- Development Agreement
- Appendix A – Site and Operations Photos
- Appendix B – Operation Contracts

BENNETT CREEK RANCH

CONDITIONAL USE PERMIT

PARCEL NUMBERS: 0181500000058 & 0181524200001
ADAMS COUNTY, COLORADO

1st Submittal Comment Responses

LandDesign for Bennett Creek Ranch, LLC
March 9, 2026

Community & Economic Development Department
4430 S. Adams County Pkwy.
1st Floor Suite W2000B
Brighton, CO 80601

RE: Bennett Creek Ranch
Gravel Pit – Conditional Use Permit
PRE-2025-00025

Applicant Responses are provided below in RED – 2026-03-05

Commenting Division: Development Engineering Review

Name of Reviewer: Steve Krawczyk

Date: 10/17/2025

ENG1: The study should address any off-site improvements that may be necessary to mitigate traffic impacts from the proposed development, such as Maintenance of existing county roads over a 30-year period. The applicant will need to address road maintenance with this proposal. Also, address if the operator has any existing access to property off E 37th Avenue, East 38th Avenue, Yuille Road, Provost Road, and Old Victory Road. A Level 3 traffic study is required if the truck traffic exceeds 40 trips/day. The traffic analysis estimates that 225 trips per day exceed that threshold.
RE: No off-site improvements are anticipated. Per Staff (Steve Krawczyk) direction, Yulle Rd. will primarily be utilized for access to the highway. Road maintenance is being coordinated by Ames Construction (gravel pit lessee) and Adams County Road maintenance supervisor, (Dillon). Mine access is provided off East 38th Ave. only. A Level III traffic study is provided with this second submittal. 100 total trips per day are requested with this CUP application (50 in/50 out).

ENG2: Colorado Department of Transportation Design & Construction Manual (CDOT) Access Permit: Please provide a copy of an approved CDOT access permit if required by the State Highway Access Code. A notice to proceed is required prior to construction. The requirements are based on the increase in truck traffic at intersections with East Colfax Avenue.
RE: Per discussions with Steve Loeffler, no permit is required at this time.

ENG3: Due to potential traffic safety problems, the county recommendation is that applicants only use the E 38th Avenue/Vulle Road route for all the mining traffic. The applicant is responsible for

constructing the appropriate public template standard (which includes paving) of E 38th Avenue and some parts of Vulle Road for a length that is equal to the development impact on the road(s) system.
RE: Applicant is willing to utilize Yulle Rd. only at the behest of the County.
As part of the gravel pit's ongoing working relationship with Adams County road maintenance, (coordinated through Supervisor Dillon), Ames Construction has hauled, installed, graded and compacted asphalt chip road base from gravel pit entrance at 38th Ave. to Yulle Rd connection. Also as a courtesy to the County, Ames perform the same grading and install to N Vanderhoof St.
Photos are provided with appendix A.

ENG4: The applicant needs to be aware that EGR (engineering review) is required; Construction documents and fees are required for all construction associated with the work in the floodplain. Please submit all plans and reports in an electronic PDF format construction plans. The floodplain and EGR submittal are required to follow the Technical Review Guidelines for Gravel Mining and Water Storage.
RE: Acknowledged. No construction is proposed with this permit application. Gravel Pit grading and reclamation plan will adhere to all State of Colorado requirements and jurisdiction. Grading and subsequent reclamation will only be performed once the Pod area has been fully mined and release from DRMS permit is pursued. No work will take place in the floodplain. Boundary of mining pods indicate slight encroachment, however that work was completed before the start of this application.

ENG5: Prior to the issuance of any construction or building permits, the developer shall enter into a Development Agreement (DA) with the County and provide a security bond for all public improvements. See the enclosed template.
RE: No building permits are anticipated.

Commenting Division: Development Engineering Review
Name of Reviewer: Steve Krawczyk
Date: 10/17/2025
Email:
Comment
ENG6: According to the requirements of the State of Colorado stormwater discharge permit, the grading, erosion, and sediment control plan must be phased. The Grading Erosion and Sediment Control Plan must clearly depict the relationship between the phases of construction and the implementation and maintenance of BMPs. All mining operations shall have a permit to excavate issued by the State of Colorado prior to beginning mineral extraction. Gravel, sand, dirt, or topsoil removal as authorized pursuant to approval of the Colorado Mined Land Reclamation Board.
RE: Acknowledged. An excavation permit has been obtained and the site continues to meet State permit requirements, including annual inspections. A copy is attached with this second submittal.

ENG7: The 100-year floodplain limits of the current floodplain shall be shown. It must be demonstrated that the outfall from the site has a means of draining into an existing drainageway. In addition, the capacity of the drainageway shall be verified.
RE: Floodplain and outfall are shown on site plan with this submittal. The project drainageway is Kiowa Creek, which can safely handle the 10-30 gpm (max.) pumping rate needed to empty the sediment pond if required. The existing outfall discharges into the onsite field. (Per Lewicki & Associates)

ENG8: The County requires that the flow released from the site be channeled (pipe or swale) to an existing drainageway. If the land(s) between the site and the drainageway is not owned by the applicant, the applicant will need to acquire an easement from the landowner(s) to accommodate the altered discharge of storm drainage flow on adjoining land(s). The easement(s) provides the right to construct and maintain the drainage swale or pipe and associated drainage improvements as required.
RE: Acknowledged. Flow released from the mining site is released into an existing drainageway. Land is owned by the same property owner, as the +/-80 AC mine boundary (with three pods comprising +/- 33 AC) is set within a +/-300 acre parcel. Flow and drainageway are identified on the attached site plan.

ENG9: Evidence is required that all the necessary permits have been obtained from Federal, State or Local governmental agencies from which prior approval is required. In the opinion of the Planning and Development Department, the applicants should contact the following agencies and should be contacted about permit requirements:
RE: State permits submitted with this second submittal

The Corps of Engineers Wetlands Permit (404 Permit) could be required before grading to address any required mitigation. The national wetland inventory maps indicate the presence of a wetland in this area. Contact Kiel Downing at (303) 979-4120. Referred to
RE: Applicant reached out to Corps. No permit expected to be necessary. Response from Daniel Ishmael:
Hi Allison, Nice speaking with you.
Aquatic resources in this area are often not jurisdictional under Section 404 of the Clean Water Act due to their ephemeral (non-relatively permanent) nature and/or lack of connectivity to downstream waters**. It is unlikely that aquatic resources regardless of jurisdiction are present within the mining permit boundary as indicated on the provided figure based on a review of aerial imagery.**
If there is a need for formal documentation from us, I recommend requesting a "dry land" Approved Jurisdictional Determination (AJD). If we determine with certainty that no aquatic resources are present in the review area, a letter will be provided stating that the review area is comprised entirely of dry land and that no Section 404 permit is required. I've attached an AJD request form. Please fill it out and return it, along with the figure you originally sent to me to denverregulatorymailbox@usace.army.mil. Please cc me. Alternatively, you can submit online at https://rrs.usace.army.mil/rrs/home/jurisdiction.
Please note that the National Wetlands Inventory (NWI) maps that depict wetlands such as those on the provided figure do not guarantee the presence/absence of wetlands or other aquatic resources. For USACE, a wetland delineation following protocols outlined in our 1987 manual and subsequent supplements are how we determine the presence and extent of wetlands. For this specific project though, the NWI maps are sufficient, but it is something to keep in mind for future reviews.
Best, Daniel Ishmael
Regulatory Specialist
Omaha District Corps of Engineers
9307 S. Wadsworth Blvd.
Littleton, CO 80128
720-948-3266

Contact the U.S. Fish and Wildlife Service Endangered Species Program at 303-236-7400 and Jordan Likes with the Colorado Parks and Wildlife at 303-291-7135 about obtaining any required permits.
RE: Reached out to both numbers above an but phone numbers were not in service. Emailed Molly West to confirm whether any additional permits are required. Molly referred to Lexi Hamous-Miller. Lexi's response below:
Hi Allison,
Thank you for reaching out about this. **You will not need a permit from us to pursue a permit through Adams County.** They may require you to consult with us on ways to minimize impacts to wildlife and include a wildlife mitigation plan in your application, but I am not entirely sure what their process is. I have included the new DWM for this area, Becca Parson, so she is aware, as she will be the one to comment during the application process. We will be commenting on the process during the DRMS process as well. As Molly stated, CPW does not have regulatory authority over species of concern as the USFWS does. We are a recommending agency, and we work with our cities, counties, and other agencies to recommend ways to avoid, minimize, and mitigate impacts to wildlife. It is up to those agencies to implement our recommendations as conditions of approval.

Can you share more information with us about the project so we can pre-emptively look into the location to see if there will be any wildlife concerns?

For land-use requests, here is our current map of contacts for your future reference. Please feel free to reach out to any of us in our respective regions with any questions or to consult on a project proposal. Thanks!
-Stay Wild, Lexi Hamous, MS (She/Her)
Northeast Region Land Use Coordinator; Colorado Parks and Wildlife

Commenting Division: Environmental Analyst Review
Name of Reviewer: Megan Grant

Resubmittal Required
ENV1. This application is required to be a new EXG permit application, as it applies to mining and extraction.
A "renewal" of the original conditional use permit is not allowed, and that permit expired in 2019. Our understanding is the property has been under new ownership since 2022. This is a completely new permit application.
RE: Acknowledged. Application language has been revised to clarify this is a new EXG permit.

The following comments apply to water and sewer:

ENV2. The applicant indicated portable restrooms will be used on the site. Please provide a copy of the contract with the portable toilet provider, including the service location and service dates (start/end). This is required for proof of sewer.
RE: Onsite portable toilets are provided and serviced by United Rentals, and an invoice from the provider as well as photos of portable toilet is provided in Appendix B.

ENV3. The applicant indicated water will be trucked in for use on the site. Please provide a copy of the contract with the water provider to provide proof of water availability and source. This is required for proof of water.
RE: Contract provided (Appendix B) from Kevin Mitchel, water provider, and sourced locally. Water is used for dust and particulate control only. Site does not provide any washed materials requiring water

ENV4. If approved, a condition of the permit would be that the residential septic system and residential water well would not be used for any mining applications.
RE: Acknowledged. Neither the residential septic system nor the residential well water are used or will be used for the gravel pit operation.

ENV5. An updated site plan is required to show the actual location of each septic system component to include tank(s), soil treatment area (leach field), and piping system, location of proposed mining areas, as well as horizontal distances in feet between septic components and site features (buildings, property lines, etc.).
The applicant indicated in response to comments:
"Site Plan utilizing aerial to depict structures, water wells, septic system for old farm house, existing and proposed mining area with boundaries, oil wells, roads, overhead electrical, oil pumps, reclamation stockpiles, etc. provided".
Please provide this updated site plan with distances shown.
RE: A scaled site plan is provided indicating actual locations of items identified above. Reclamation sockpiles will be located within mining pod areas.

The following comments apply to natural resources:
ENV6. Please provide copies of environmental studies and resources review documentation completed for the project for Adams County review.
RE: Studies and resources provided.

ENV7. A cross-section of the subject parcel is located within the Natural Resource Conservation Overlay (NRCO), corresponding to the 100-year floodplain also transecting the parcel. The NRCO aims to protect important wildlife areas, designated floodplains, riparian corridors, and cultural resources. Refer to Sections 3-43 and 4-14-02 of the Adams County Development Standards and Regulations (ACDSR) for more details.
RE: Acknowledged. No new development, facilities, or structures are proposed.

ENV8. If disturbance of land not previously developed within the NRCO is greater than one (1) acre, then a Resources Review must be completed by a qualified professional consultant prior

to application submittal so that it may be taken into consideration. See ACDSR Section 4-14-02-03 for Resources Review methodology.
RE: No previously undeveloped land is being developed with this conditional use permit. Additionally, only approximately 0.7 acres (under one acre) of the mining pods overlap with the 100 year floodplain.

ENV9. All development must comply with the NRCO buffers/setbacks requirements for individual protected resources provided in ACDSR Section 4-14-02-04-02. Development shall be located out of the riparian plant community along rivers and streams, and outside of the hydric zone in relation to wetlands.
RE: Mining boundary is located outside of the riparian boundary.

Commenting Division: Environmental Analyst Review
Name of Reviewer: Megan Grant
The following comments apply to operations:

ENV10. Please provide the updated Operator Contract with Ames Construction for Adams County review.
RE: Contract Provided (see Appendix B)

ENV11. Please provide copies of current Colorado Division of Reclamation, Mining, and Safety (DRMS) mining permits and Colorado Department of Public Health and Environment (CDPHE) air permits. These will be required for Adams County review.
RE: DRMS and CDPHE permits provided with this second submittal

ENV12. All requirements and fugitive dust control measures prescribed within the DRMS permit(s) and CDPHE air permit(s) must be in place and functional at all times.
RE: Acknowledged. All measures from the DRMS, including water trucks for dust control are in place (photos attached in Appendix A)

ENV13. The applicant/operator shall permanently install a wind gauge, such as an anemometer, with datalogging capabilities to continuously monitor wind speeds during mining and material handling operations. The operator shall stop all mining and material management activities when wind speeds exceed a sustained 25 mph and when gusts exceeding 35 mph occur.
RE: Acknowledged. Wind gauge is in place. (photo evidence provided in appendix A.)

ENV14. The applicant shall provide details of complaints received, offsite impact resolution, and high-wind shutdown periods, as applicable, within the required report submissions and made available to Adams County.
RE: Acknowledged.

ENV15. All complaints received by the applicant concerning impacts to offsite properties, and the resolution of those complaints shall be conveyed to the Director of Community and Economic Development. Impacts to offsite properties shall be responded to and resolved immediately by the applicant. If the impact cannot be immediately resolved, within five (5) days of complaint receipt the applicant shall notify the Director of the offsite impact, proposed resolution, and expected completion date.
RE: Acknowledged. All complains have been responded to/address and forwarded onto Planning Staff. Applicant will continue this.

ENV16. All haul trucks shall cover their loads pursuant to Colorado Revised Statutes 42-4-1407.
RE: Acknowledged. All haul truck loads will continue to be covered. Photos attached with appendix A.

ENV17. The applicant shall follow all applicable hazardous materials and waste management regulations to ensure proper management of hazardous materials and waste such that they do not present a significant actual or potential hazard to public health, safety, or environment.
RE: Acknowledged.

ENV18. The limited mention of operations and materials management in the project narrative is not sufficient to address this comment. An Operations & Materials Management Plan is required and shall include:
RE: Acknowledged. All items listed below are now included in the narrative, in addition to in this comment response.

1) A physical description of the facility and the types of materials managed;
RE: There is no on-site facility (no buildings or permanent equipment). The gavel pit materials are fill dirt and sand, no other materials are managed on-site.

2) A description of amount of material on-site, frequency of operations, and anticipated turnover rate; Approximately.
RE: The gravel pit material consists of approximately 700,000 cubic yards of fill dirt, and class 1 sand typically used for building up grades at a construction sites and fill around foundations. No other types of materials are supplied from this site. The site operates M-F 6am-6pm. Anticipated turnover rate is approximately 100,000 cubic yards annually.

5) A description and location on the site plan of the stockpile locations and heights; the stockpiles may only be placed as specified in the operations plan;
RE: The only material stockpiled on site is top soil which is used for reclamation purposes, all other materials are loaded directly into haul trucks. Should any materials be stock piled onsite the stockpiles will not exceed height of the fence bordering the property. The site map will call out the area and height of stock piles. Stockpiles will only be within mining pods.

6) A description of methods to prevent unauthorized vehicle traffic and illegal dumping by adequate fencing or other security means;
RE: The gravel pit has only one entrance which is on 38th Ave. and is gated. There is a security camera mounted for monitoring purposes. (Appendix A attached photo of camera)

7) Specifics on material acceptance and handling including screening procedures for incoming loads and the process for handling unacceptable materials;
RE: Only clean fill dirt is be accepted at the gravel pit, though currently no fill materials are being accepted. There is a rock screen on site. Unacceptable materials are refused and sent back with the hauler.

8) Records maintenance and retention: records shall be maintained in accordance with 4-10-02-06-07(5.)

9) RE: acknowledged

10) A plan for the disposition of equipment and collected materials on-site at the time of closure/end of site operations.
RE: All gravel pit equipment on site is mobile. Under the State issued permit M1983060, once a Pod area has completed its extraction of material, the area is re-graded, topsoil which is stock piled onsite is respread and graded and the entire area is reseeded for natural growth of dryland grass.

ENV19. All nuisance control measures as outlined in the permit application, DRMS permit, CDPHE permit, and other applicable permits shall be implemented and followed, as related to visible emissions, off-property transport, and off-vehicle transport of particulate matter for the site's activities, roads, and trucks.

RE: Acknowledged. Control measures such as wind monitoring, dust control by water trucks both onsite and off site are implemented. See photos of water truck in operation as well as wind monitoring equipment attached with Appendix A.

ENV20. Exposure to air pollution is associated with numerous health problems including asthma, lung cancer, and heart disease. Traffic in unpaved areas may contribute to increased fugitive dust emissions. Applicant will be required to implement dust control measures to prevent off-site impacts if truck traffic into and within parcel occurs on non-paved surfaces, as well as from operational activities.
RE: Acknowledged. Control measures such as wind monitoring, dust control by water trucks both onsite and off site are implemented. See photos of water truck in operation as well as wind monitoring equipment.(Appendix A)

ENV21. All hydraulic fluids, oils, and other pollutant sources used on site should be stored within a covered area and in secondary containment.
RE: No fluids, oils, or other pollutant sources are stored onsite. When necessary, a maintenance truck which provides fluids for equipment is brought in for filling and is then removed from the site. (Statement added to maintenance and operation plan)

ENV22. Applicant/operator should limit engine idling to the maximum extent feasible to mitigate off-site noise and air quality impacts to surrounding properties and shall not exceed five minutes within any sixty-minute period, except as authorized. Refer to CRS Title 42 – Vehicles and Traffic Idling Standard, Article 14 – State Idling Standard, Section 42-14-105. Idling for Colorado law.
RE: Engine idling is limited to 5 minutes within a 60 minute period. Engine idling typically only takes place during equipment warm up periods at the beginning of the work day, and is limited to 5 minutes. (Statement added to maintenance and operation plan)

ENV23. Regular exposure to elevated sound levels can have a negative impact on both physical and mental health by increasing the risk of stress, hearing impairment, hypertension, ischemic heart disease, and sleep disturbance. Noise attenuation shall comply with the Colorado Noise Statute (CRS 25-12-103) and applicable, local noise regulations. A noise analysis should be conducted to evaluate the potential impact of noise from the proposed use to surrounding areas. All necessary steps should be taken to mitigate off-site noise.
RE: A noise analysis is conducted by the onsite foreman every 90 days to ensure standard daily operations don't exceed the Colorado Noise Statute. (Statement added to maintenance and operation plan

- **Colorado Noise Statute**

25-12-103 - Maximum permissible noise levels.

(1) Every activity to which this article is applicable shall be conducted in a manner so that any ***noise*** *produced is not objectionable due to intermittence, beat frequency, or shrillness. Sound levels of* ***noise*** *radiating from a property line at a distance of twenty-five feet or more therefrom in excess of the db(A) established for the following time periods and zones shall constitute prima facie evidence that such* ***noise*** *is* a public nuisance:

7:00 a.m. to	**7:00 p.m. to**

Zone	next 7:00 p.m.	next 7:00 a.m.
Residential	55 db(A)	50 db(A)
Commercial	60 db(A)	55 db(A)
Light industrial	70 db(A)	65 db(A)
Industrial	80 db(A)	75 db(A)

*(2) In the hours between 7:00 a.m. and the next 7:00 p.m., the **noise** levels permitted in subsection (1) of this section may be increased by ten db(A) for a period of not to exceed fifteen minutes in any one-hour period.*

ENV24. Outdoor storage, including stockpiles, shall not exceed the height of the fence, unless otherwise approved. The stockpiles may only be placed as specified in the operations plan.
RE: The only material stockpiled on site is top soil which is used for reclamation purposes, all other materials are loaded directly into haul trucks. Should any materials be stock piled onsite the stockpiles will not exceed height of the fence bordering the property. Stockpiles are only located within mining pods.

ENV25. The applicant shall implement sediment control measures that effectively prevent the tracking of mud, dirt, or debris from the site onto adjacent public rights-of-way.
RE: Water trucks are used to mitigate dust and debris on dirt roads. The public rights-of-way adjacent to the site consist of dirt road. The nearest paved road is Yulle Rd. Road sweeper equipment is used to mitigate any dirt, mud, or debris from paved roads in the area. See photo of street sweeper operation attached (Appendix A)

ENV26. Lighting facilities shall be arranged and positioned so no direct light or reflection creates a nuisance or hazard on any adjacent property or right-of-way.
RE: Acknowledged. There are no lighting facilities onsite, only equipment lights are used. No nuisance is created by equipment with operating lights. Hours of operation are 6am-5pm in winter months and 6am-6pm in the summer months. Daily operations do not require site lighting therefore no site lighting exists.

ENV27. The operator will need to ensure that refuse (trash) is properly controlled and collected as often as necessary to prevent nuisance conditions.
RE: Operator understands that the site must maintain good housekeeping protocols so as to prevent any trash nuisance conditions. Trash, if any, is removed from the site daily.

ENV28. This site is subject to inspection from Adams County inspectors, during reasonable working hours. Adams County may give notice of inspection prior to the inspection.
RE: Operator understands that Adams County inspectors may need access to the site for periodic inspections.

The following comments apply to inert fill:

ENV29. If filling/remediation is planned, please include information in your subsequent permit application(s). Inert fill must meet the definition of clean, inert material as specified by both the ACDSR and DRMS permit.

RE: Inert fill will only be used at time of remediation when each mining pod is retired. Operator understands that if fill materials must be clean and consistent with State permit requirements.

ENV30. Control of the fill materials, keeping records of the sources of the materials used at this site, shall be the responsibility of the applicant. Records concerning sources of fill materials and certifications shall be made available to Adams County inspectors upon request.
RE: Operator understands it is our responsibility to keep records of material sources if fill materials are brought into the site, and records will be made available upon request.

ENV31. Authorized personnel trained to recognize non-inert material shall be present on site while filling is taking place and shall inspect and screen each load of material brought to the fill site. Loads containing trash, organic material, and other waste material not meeting the definition of inert material shall be wholly rejected and documented as such. All non-inert materials identified and removed from the inert fill location shall be segregated and disposed of at an approved waste disposal facility at regular intervals and records of disposal shall be kept.
RE: Operator understands; trained personnel will be onsite if fill material is brought into the site. Any fill material when brought into the site will be inspected for trash, organics, and other waste materials, all non-inert materials will be documented and removed from the site and delivered to the appropriate waste disposal facility. No fill materials are currently accepted at this site.

The following comments apply to oil and gas:

ENV32. There are multiple producing, shut in, and plugged and abandoned oil and gas wells on the subject parcel and adjacent parcels. The applicant has shown these well locations on the site plan.
RE: Confirmed

ENV33. All known oil and gas well flow lines and/or easements shall be graphically depicted on the site-specific development plan. Though some the wells may not be active, that does not mean that the flowlines were removed. In the interest of public health and safety, Adams County recommends that the applicant verify the status and location of the flowlines.
RE: Operator has identified active and inactive flowlines of oil and gas facilities adjacent to the pit. Proper setbacks will be maintained to prevent any public health and safety hazards.

ENV34. Adams County has requirements for residential construction currently, and this may expand to all construction in the future. The applicant should be aware of the standards and regulations, and adherence is recommended for safety and environmental health. Please refer to Adams County Development Standards and Regulations (ACDSR) Section 4-11-02-03-03-05 Residential Construction Standards. For active oil and gas wells (which includes producing and shut in), the setback is 250 feet from the well and no structures may be constructed in that buffer area. Access will be provided by a public street or recorded easement for private access.
RE: Acknowledged. No construction is proposed with this use permit. Existing structures are outside of buffer areas.

a) For plugged and abandoned wells, there shall be dedicated a well maintenance and workover setback depicted on the plat, the dimensions of which shall be not less than fifty feet in width and 100 feet in length. No permanent structures shall be located within this setback. The plugged and abandoned well shall be located in the center of the setback. There shall be public access for ingress and egress to the setback of a width of not less than twenty feet.
RE: Acknowledged. No structures are proposed. Setbacks and buffers are indicated as noted on site map. No plat is provided/required with this use permit. Applicant acknowledges requirements for maintenance ingress/ egress.

ENV35. Well details and location, as well as historical aerials and records, are available through the Colorado Energy and Carbon Management Commission (ECMC), formerly the Colorado Oil & Gas Conservation Commission (COGCC), website and map features: https://ecmc.colorado.gov/data-maps/cogis-database
RE: ECMC utilized for well details and locations.

Resubmittal Required
ROW1: Site plan needs to show record boundary with dimensions, any existing easements, location of existing roads for access purposes, existing structures with tie dimensions to the record boundary, and location of 100-year floodplain.
RE: Scaled site map provided by the operator identifies permit boundary with dimensions, roads, structures and floodplain.

Commenting Division: Planner Review
Name of Reviewer: Nick Eagleson
Date: 10/16/2025

PLN01. Request is for a Conditional Use Permit to allow mining and extraction in the A-3 zone district. Original CUP case# is 69-83-C. Case was attempted to be amended in 1989 (69-83-C(A)) but was later withdrawn.
RE: Acknowledged.

PLN02: The site is currently operating, which should not occur until an approved CUP.
RE: Acknowledged. Mining operations have been halted until this CUP is approved. Only grading and reclamation activities are occurring.
PLN03: What is the proposed timeline for current mining area? It appears there are two future mining PODS shown. What is the proposed timeline for each of those? 25-30 years mentioned in the application for all three? Asking for 20-year expiration?
RE: The timeline for the current mining area is 1 year, though the only operations taking place in the current mining area is grading and reclamation activity per State requirements. The two future PODS will take 2-3 years each to fully mine. Regular mining activity only occurs when projects in the vicinity of the pit are active. The basis for a 20-year proposed expiration for the CUP is due to the fact that mining operations are not constant they are subject to the supply/demand requirements of the I-70 corridor. There will be times when the only activity at the site are grading and reclamation activities. The operator believes the mine will be fully complete with all mining operations by 2035 and intends to have the entire area reclaimed at released from State permit at that time.

PLN04: Identify more accurately and outline the specific areas this CUP request is for.
RE: Boundary has been revised since first submittal to accurately reflect state permit area. CUP application is for the +/- 77 acre mining boundary, with individual mining pods delineated on the site map. Boundary marker images included with Appendix A.

PLN05: The current route B shows 70% of daily trips along Yulle Rd. and 30% along Provost and Old Victory Road. Operations summary states 50% will be split between the two routes, please clarify. What will be done to ensure drivers do not speed on either of these routes?
RE: Operator originally proposed a split haul route. County traffic engineer recommended only using Yulle Rd as the haul route. Operator would prefer to be allowed a 50/50 split between Yulle Rd and Old Victory Rd and at its discretion from time-to-time use either road. Speed limit signs exist on both the County roads and the onsite roads within the pit boundary.

PLN06: Please provide a copy of the approved CUP that expired in 2019.
RE: Unable to locate this CUP

PLN07: Please acknowledge and respond to all referral agency and public comments.
RE: All referral and agency comments have been responded to. Applicant will continue to respond.

PLN08: Provide copy of approved Discharge Permit from CDPHE
RE: CDPHE permit provided with this second submittal

PLN09: Improvements Agreement for roadway repairs, remediation plan, etc. will be required.
RE: See attached agreement specifications for roadway repairs

PLN10: Is there the potential to reduce the amount of truck trips per day? Currently states 200/day.
RE: Operator originally proposed 200 trips per day. This has been revised based on community comments to a proposed 100 trips per day.

PROJECT TEAM

Applicant/Property Owner:
Bennett Creek Ranch, LLC
John Wakeham
4545 Yulle Rd
Bennett Co. 80102
720-335-1874
Digbossjohn@gmail.com

Applicant Representative/Landscape Architect:
LandDesign
Allison Hibbs
3070 Blake Street, Ste. 200
Denver, CO 80205
303-880-2260
ahibbs@landdesign.com

Environmental Engineer:
Lewicki & Associates
Ben Langenfeld
3375 W Powers Circle
Littleton, CO 80123
720-842-5321 x1
benl@lewicki.biz

Traffic Engineer:
Fox Tuttle Transportation Group
Cassie Slade & Chris Sobie
1580 Logan St Suite 600
Denver, CO 80203
303-652-3571
Cassie.slade@foxtuttle.com

BENNETT CREEK RANCH

CONDITIONAL USE PERMIT

PARCEL NUMBERS: 0181500000058 & 0181524200001
ADAMS COUNTY, COLORADO

LETTER OF INTRODUCTION

LandDesign for Bennett Creek Ranch, LLC
August 28, 2025
Revised 3.6.2026

Community & Economic Development Department
4430 S. Adams County Pkwy.
1st Floor Suite W2000B
Brighton, CO 80601

RE: Bennett Creek Ranch
Gravel Pit – Conditional Use Permit
PRE-2025-00025

INTRODUCTION

The Bennett Creek Ranch Gravel Pit is located in Adams County, Colorado, approximately two miles northeast of Bennett, CO. The site is comprised of two parcels, 0181500000058 and 0181524200001, totaling +/- 300 Acres. The sand and gravel mining activity, Thornburg Pit, is located centrally, with extents a minimum of 25' off adjacent property boundaries, and consists of +/- 78 acres.

A Conceptual Review Meeting was held on May 15, 2025. A Conditional Use Permit will be required to continue extraction use, requiring two public hearings (one before Planning Commission and one before the Board of County Commissioners). A neighborhood meeting was held on July 2nd, 2025; The neighborhood meeting presentation and notes are provided in the submittal attachments.

The site has been functioning as a current mining and extraction site for decades. No new structures are proposed with this application. No on-site water or sewer will be utilized. Water will be hauled in for dust mitigation.

Trucks hauling off mined material will be routed in two directions to the south to reduce trips on any one route. At the bequest of the County, trucks will utilize the Yulle Road route to East Colfax Avenue.

PROJECT OVERVIEW

CURRENT PERMITS:	DRMS 2024 Mining Permit # M1983060 Discharge Monitoring Report (DMR): COG502235 Air Quality Permit: 25AD0386
EXTRACTION TYPE:	Commercial
TOTAL AREA DESIGNATED AS GRAVEL MINE:	+/- 78 Acres
ESTIMATED EXTRACTION TO BE LEFT:	+/- 70% (2.5 million cubic yards)
TIME FOR EXTRACTION TO LAST:	Estimated 20-30 years
TIMELINE FOR RECLAIMATION:	Within 180 days after mining is complete
TOTAL AREA OF THE EXTRACTION REQUEST:	+/- 78 Acres
EXPIRATION:	20 Years
CURRENT USE OF THE SITE:	Graveling mining – Approx. 20 haul loads per day
HOURS OF OPERATION:	6am – 5pm (winter) 6pm (summer) (weekdays only)
DAILY TRIPS:	Up to 100 trips per day (50 trucks in/out)

OPERATIONS AND MAINTENANCE PLAN

- Thornburg Pit will operate under a Conditional Use Permit to allow for the extraction of sand and fill dirt. No additional materials are managed-on site. There is no structure or on-site facility associated with the mining operation, and no permanent equipment.
- The gravel pit material consists of approximately 700,000 cubic yards of fill dirt, and class 1 sand typically used for building up grades at a construction sites and fill around foundations. No other types of materials are supplied from this site. The site operates M-F 6am-6pm. Anticipated turnover rate is approximately 100,000 cubic yards annually.
- Topsoil used for reclamation purposes will be stockpiled on site, only where indicated in the site map. Stockpiles shall not exceed height of the fence bordering the property.
- Excavation and haul-off operations permitted between 6am and 6pm only.
- Site is fenced, with a locked gate at the primary access to prevent unauthorized access or dumping. The gravel pit has only one entrance, which will remain gated. A security camera will remain mounted for monitoring purposes.
- Water trucks will travel in front of haul-off trucks on dirt roads to mitigate dust
- Haul-off loads must be covered during transport.
- No sifting/use of a screen will occur on site. Only clean fill dirt is to be accepted at the gravel pit. A rock screen is provided on site. Unacceptable materials are refused and sent back with the hauler.
- No truck maintenance to be permitted onsite.
- No fluids, oils, or other pollutant sources are stored onsite. When necessary, a maintenance truck which provides fluids for equipment is brought in for filling and is then removed from the site.

- Onsite equipment (owned and operated by contracted excavation company):
    - 2 Excavators
    - 2 Wheel Loaders
    - 2 Water Trucks
    - 1 Blade / Road Grader
- Engine idling is limited to 5 minutes within a 60 minute period. Engine idling typically only takes place during equipment warm up periods at the beginning of the work day, and is limited to 5 minutes.
- A noise analysis shall be conducted by the onsite foreman every 90 days to ensure standard daily operations don't exceed the Colorado Noise Statute.
- Records maintenance and retention: records shall be maintained in accordance County requirements.
- All gravel pit equipment on site shall remain mobile. Under the State issued permit M1983060, once a Pod area has completed its extraction of material, the area is re-graded, topsoil which is stock piled onsite is respread and graded and the entire area is reseeded for natural growth of dryland grass.
- All trash must be removed from sight daily and disposed of properly
- All drainage from the site shall utilize the existing outfall indicated on the site map. The outfall shall discharge into the field onsite. In the event water needs to be pumped out, the drainageway is Kiowa Creek, which will handle a maximum of 30 gpm.

REVIEW AND APPROVAL CRITERIA FOR MINING & EXTRACTION CUP

1. The conditional use is permitted in the applicable zone district
Response: Mining is an approved conditional use in the current zone district (A-3)

2. The conditional use is consistent with the purposes of these standards and regulations.

Response: The conditional use of sand/gravel/dirt mining is consistent with these standards.

3. The conditional use will comply with the requirements of these standards and regulations including, but not limited to, all applicable performance standards.

Response: Acknowledged. The mining operations will comply with these requirements.

4. The conditional use is compatible with the surrounding area, harmonious with the character of the neighborhood, not detrimental to the immediate area, not detrimental to the future development of the area, and not detrimental to the health, safety, or welfare of the inhabitants of the area and the County. In making this determination, the Planning Commission and the Board of County Commissioners shall find, at a minimum, that the conditional use will not result in excessive traffic generation, noise, vibration, dust, glare, heat, smoke, fumes, gas, odors, or inappropriate hours of operation.

Response: The requested use is consistent with current operations on site. The Thornburg pit has operated as a gravel mine for decades and this request is for a new permit to continue mining operations. The mine is located on only a portion of the +/-300 acres owned by the Applicant. Additionally, the applicant's personal residence is adjacent to the property and the applicant would be immediately aware of any negative impacts. The haul routes are anticipated to use two access points to limit the amount of traffic passing adjacent properties. Only +/-20 neighboring properties abut the site, and all will be notified and provided a chance to offer input at a neighborhood meeting.

5. The conditional use permit has addressed all off-site impacts.

Response: The CUP application addresses all off-site impacts and complies with state requirements.

6. The site is suitable for the conditional use including adequate usable space, adequate access, and absence of environmental constraints.

Response: The +/-300-acre site containing a +/-78 acre mine is adequate for the proposed use. No negative environmental impacts are anticipated, and access points have been identified on the site plan.

7. The site plan for the proposed conditional use will provide the most convenient and functional use of the lot including the parking scheme, traffic circulation, open space, fencing, screening, landscaping, signage, and lighting.

Response: The mine would remain in its current location, with no proposed structures or changes to the existing usage. The mining operations are set back hundreds of feet from property lines.

8. Sewer, water, storm water drainage, fire protection, police protection, and roads are to be available and adequate to serve the needs of the conditional use as designed and proposed.

Response: Water and sewer are not anticipated uses for the proposed permit. Water for dust control will be hauled to the site and porta-lets will be utilized.

ATTACHMENTS

- Site Plan
- Haul Route Map
- Copy of DMRS (State Mining Permit)
- Copy of APEN (Air Quality Permit)
- Neighborhood Meeting Notes
- Conceptual Review Meeting Notes & Responses
- Appendix A: Site Photos
- Appendix B: Operations Invoices and Contracts
- Agreement Specifications for Roadway Repairs

CONCLUSION

The applicant and design team want to thank Adams County for the opportunity to present this Bennett Creek Ranch Conditional Use Permit application for review and approvals. We look forward to working closely with staff and the outside referral agencies to provide all required documentation in order to obtain this permit and continue sand and gravel mining operations. Please reach out to any of the contacts below with questions, comments, or need for additional information. Thank you.

Sincerely,

Allison Hibbs
LandDesign
Senior Designer II

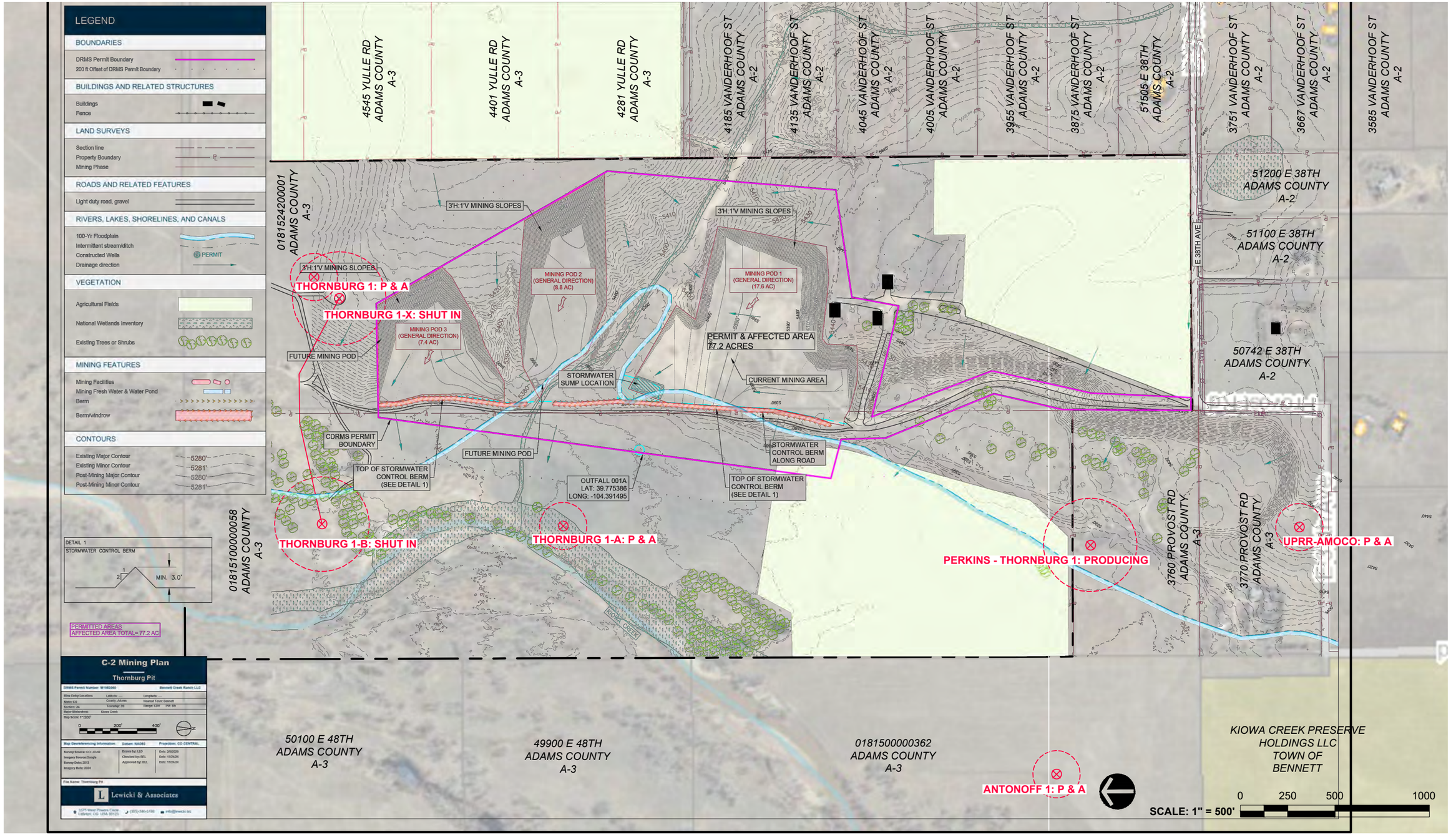
PROJECT TEAM

Applicant/Property Owner:
Bennett Creek Ranch, LLC
John Wakeham
4545 Yulle Rd
Bennett Co. 80102
720-335-1874
Digbossjohn@gmail.com

Applicant Representative/Landscape Architect:
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3070 Blake Street, Ste. 200
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Environmental Engineer:
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Traffic Engineer:
Fox Tuttle Transportation Group
Cassie Slade & Chris Sobie
1580 Logan St Suite 600
Denver, CO 80203
303-652-3571
Cassie.slade@foxtuttle.com



CONDITIONAL USE PERMIT ▪ MAP

BENNETT CREEK RANCH ▪ ADAMS COUNTY, CO

PW2025-03

NOTE: DATA FROM LEWICKI & ASSOCIATES SITE MAP (CO LIDAR, GOOGLE) 2024 & ADAMS COUNTY GIS, 2025

LandDesign.

LEGEND

BOUNDARIES
- DRMS Permit Boundary

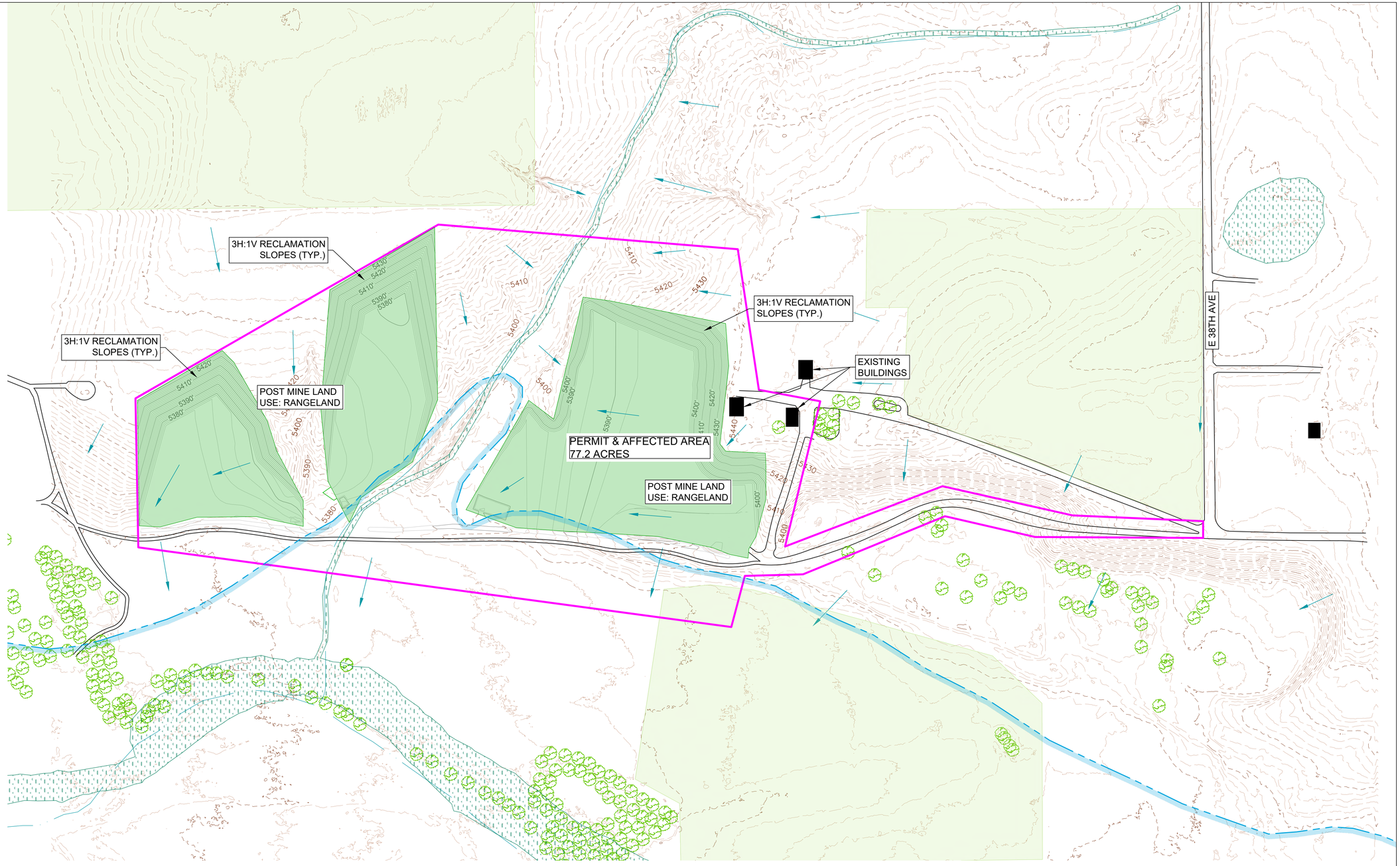
BUILDINGS AND RELATED STRUCTURES
- Buildings
- Fence

ROADS AND RELATED FEATURES
- Light duty road, gravel

RIVERS, LAKES, SHORELINES, AND CANALS
- 100-Yr Floodplain
- Intermittent stream/ditch

VEGETATION
- Agricultural Fields
- National Wetlands Inventory
- Reclamation Seeding
- Existing Trees or Shrubs

CONTOURS
- Existing Major Contour — 5280'
- Existing Minor Contour — 5281'
- Reclamation Major Contour — 5280'
- Reclamation Minor Contour — 5281'



PERMITTED AREAS
AFFECTED AREA TOTAL= 77.2 AC

F-1 Reclamation Plan

Thornburg Pit

DRMS Permit Number: M1983060 — **Bennett Creek Ranch LLC**

Mine Entry Location:	Latitude: ----	Longitude: ----
State: CO	County: Adams	Nearest Town: Bennett
Section: 24	Township: 3S	Range: 63W PM: 6th
Major Watershed:	Kiowa Creek	

Map Scale: 1"=200'

0 — 200' — 400' — N

Map Georeferencing Information: **Datum: NAD83** **Projection: CO CENTRAL**

Survey Source: CO LIDAR	**Drawn by:** LLD	Date: 2/9/2026
Imagery Source: Google	**Checked by:** BEL	Date: 11/24/24
Survey Date: 2013	**Approved by:** BEL	Date: 11/24/24
Imagery Date: 2024		

File Name: Thornburg Pit

Lewicki & Associates

3375 West Powers Circle
Littleton, CO USA 80123
(303)-346-5196
info@lewicki.biz



CONDITIONAL USE PERMIT ▪ ROUTE HAUL MAP

BENNETT CREEK RANCH ▪ ADAMS COUNTY, CO

PW2025-03

7/9/2025 3:26 PM AHIBBS J:\JOBS\2025-03-BENNETT CREEK RANCH CUP\DRAWINGS\PLAN WEST\WORKING FILES\CUP JULY 2025 - ACAD-THORNBURG PIT 250514-MODEL.DWG

LandDesign.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

NAME: Bennett Creek Ranch LLC

ADDRESS: 4545 Yulle Rd
Bennett, CO 80102

FACILITY: THORNBURG PIT

LOCATION: 50747 E 38 AVE
BENNETT, CO 80102

ATTN: John Wakeham, Mgr

COG502235	001A-2
PERMIT NUMBER	**DISCHARGE NUMBER**

MONITORING PERIOD	
MM/DD/YYYY	**MM/DD/YYYY**
03/07/2025	03/31/2025

DMR Mailing ZIP CODE: 80102

MINOR

Discharge to Kiowa Creek
External Outfall

No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Conductivity	SAMPLE MEASUREMENT	******	******	******	******		******				
00094 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 30DA AVG	******	dS/m		Quarterly	Grab
pH	SAMPLE MEASUREMENT	******	******	******		******					
00400 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	6.5 MINIMUM	******	9 MAXIMUM	SU		Twice per Month	Grab
Solids, total suspended	SAMPLE MEASUREMENT	******	******	******	******						
00530 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	30 30DA AVG	45 MX 7D AV	mg/L		Twice per Month	Grab
Oil and grease	SAMPLE MEASUREMENT	******	******	******	******	******					
03582 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	10 INST MAX	mg/L		Contingent	Grab
Flow, in conduit or thru treatment plant	SAMPLE MEASUREMENT				******	******	******	******			
50050 1 0 Effluent Gross	PERMIT REQUIREMENT	.1 30DA AVG	Req. Mon. DAILY MX	MGD	******	******	******	******		Monthly	Recorder (auto)
Oil and grease visual	SAMPLE MEASUREMENT	******			******	******	******	******			
84066 1 0 Effluent Gross	PERMIT REQUIREMENT	******	Req. Mon. INST MAX	abst=0; prst=1	******	******	******	******		Twice per Month	Visual

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		TELEPHONE		DATE
		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT			
TYPED OR PRINTED			AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

Chronic flow limit - see Note 1, pg 12. Oil and grease - see Note 3, pg 12. Total flow - see Note 4, pg 12. Phosphorus monitoring - see Note 6, pg 12. Selenium loading calculation - see Note 7, pg 12.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

NAME: Bennett Creek Ranch LLC

ADDRESS: 4545 Yulle Rd
Bennett, CO 80102

FACILITY: THORNBURG PIT

LOCATION: 50747 E 38 AVE
BENNETT, CO 80102

ATTN: John Wakeham, Mgr

COG502235	001A-2
PERMIT NUMBER	**DISCHARGE NUMBER**

MONITORING PERIOD	
MM/DD/YYYY	**MM/DD/YYYY**
04/01/2025	06/30/2025

DMR Mailing ZIP CODE: 80102

MINOR

Discharge to Kiowa Creek
External Outfall

No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Conductivity	SAMPLE MEASUREMENT	******	******	******	******		******				
00094 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 30DA AVG	******	dS/m		Quarterly	Grab
pH	SAMPLE MEASUREMENT	******	******	******		******					
00400 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	6.5 MINIMUM	******	9 MAXIMUM	SU		Twice per Month	Grab
Solids, total suspended	SAMPLE MEASUREMENT	******	******	******	******						
00530 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	30 30DA AVG	45 MX 7D AV	mg/L		Twice per Month	Grab
Oil and grease	SAMPLE MEASUREMENT	******	******	******	******	******					
03582 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	******	10 INST MAX	mg/L		Contingent	Grab
Flow, in conduit or thru treatment plant	SAMPLE MEASUREMENT				******	******	******	******			
50050 1 0 Effluent Gross	PERMIT REQUIREMENT	.1 30DA AVG	Req. Mon. DAILY MX	MGD	******	******	******	******		Monthly	Recorder (auto)
Oil and grease visual	SAMPLE MEASUREMENT	******			******	******	******	******			
84066 1 0 Effluent Gross	PERMIT REQUIREMENT	******	Req. Mon. INST MAX	abst=0; prst=1	******	******	******	******		Twice per Month	Visual

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		TELEPHONE		DATE
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code	NUMBER	MM/DD/YYYY

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Chronic flow limit - see Note 1, pg 12. Oil and grease - see Note 3, pg 12. Total flow - see Note 4, pg 12. Phosphorus monitoring - see Note 6, pg 12. Selenium loading calculation - see Note 7, pg 12.

COLORADO
Air Pollution Control Division
Department of Public Health & Environment

CONSTRUCTION PERMIT

Permit Number: **25AD0386 (Issuance 1)**

Date Issued: **1/23/2026** **517016**

Issued To: **Bennett Creek Ranch, LLC.**

Facility Name: Thornburg Pit
Plant AIRS ID: 001-2345
Physical Location: 39.7735490, -104.389309
County: Adams County
General Description: Aggregate mining pit

Equipment or activity subject to this permit:

AIRS Point	Description
001	Material extraction, handling, stockpiling, hauling, associated conveyors and transfer points.

THIS PERMIT IS GRANTED SUBJECT TO ALL RULES AND REGULATIONS OF THE COLORADO AIR QUALITY CONTROL COMMISSION AND THE COLORADO AIR POLLUTION PREVENTION AND CONTROL ACT C.R.S. (25-7-101 et seq), TO THOSE GENERAL TERMS AND CONDITIONS INCLUDED IN THIS DOCUMENT AND THE FOLLOWING SPECIFIC TERMS AND CONDITIONS:

REQUIREMENTS TO SELF-CERTIFY FOR FINAL APPROVAL

1. **You must notify the Air Pollution Control Division (Division) no later than fifteen (15) days after commencement of operation under this permit by submitting a Notice of Startup (NOS) to the Division.** The NOS must be submitted using the Division's online submission tool on the Division's self-certification webpage. Failure to notify the Division of startup of the permitted source is a violation of AQCC Regulation Number 3, Part B, Section III.G.1, and can result in the revocation of the permit.

2. Within one hundred and eighty (180) days after commencement of operation or issuance of this permit, whichever is later, compliance with the conditions contained on this permit must be demonstrated to the Division. It is the permittee's responsibility to self-certify compliance with the conditions. Failure to demonstrate compliance within 180 days may result in revocation of the permit or enforcement action by the Division. Information on how to certify compliance was mailed with the permit or can be obtained from the Division's website. Search for "Colorado air permit self-certification" in a search engine to find self-certification information. (Reference: Regulation Number 3, Part B, Section III.G.2.)

3. This permit will expire if the owner or operator of the source for which this permit was issued: (i) does not commence construction/modification or operation of this source within eighteen (18) months after either, the date of issuance of this construction permit or the date on which such construction or activity was scheduled to commence as set forth in the permit application associated with this permit; (ii) discontinues construction for a period of 18 months or more; or (iii) does not complete construction within a reasonable time of the estimated completion date. The Division may grant extensions of the deadline per Regulation Number 3, Part B, Section III.F.4.b. (Reference: Regulation Number 3, Part B, Section III.F.4.)

4. Within one hundred and eighty (180) days after commencement of operation or issuance of this permit, whichever is later, the operator must complete all initial compliance testing and sampling as required in this permit and submit the results to the Division as part of the self-certification process. (Reference: Regulation Number 3, Part B, Section III.G.2.)

5. Within thirty (30) days after commencement of operation or issuance of this permit, whichever is later, the AIRS ID number (example: 001-2345-001) must be posted in an easily-visible location for ease of identification. (Reference: Regulation Number 3, Part B, Section III.G.2.) (State-only enforceable)

EMISSION LIMITATIONS AND RECORDS

6. Emissions of air pollutants must not exceed the following limitations (as calculated using the emission factors included in the "Notes to Permit Holder" section of this permit). (Reference: Regulation Number 3, Part B, II.A.4)

Annual Limits (tons per year):

Emission Source	AIRS Point	PM	PM_{10}	$PM_{2.5}$	Emission Type
Mining, Hauling, & Storage Operations	001	0.6	0.3	N/A	Fugitive

See "Notes to Permit Holder" for information on emission factors and methods used to calculate limits.

Note: In the absence of credible evidence to the contrary, compliance with the emission limits is demonstrated by complying with the production limits listed below and by following the attached particulate emissions control plan.

PROCESS LIMITATIONS AND RECORDS

7. This source must be limited to the following maximum consumption, processing and/or operational rates as listed below. Daily and annual records of the actual process rate must be maintained by the applicant and made available to the Division for inspection upon request. (Reference: Regulation Number 3, Part B, Section II.A.4.)

Production Limits:

AIRS Point	Production Parameter	Daily Limit (tons/day)	Annual Limit (tons/year)
001	Sand and gravel extraction	4,000	100,000

STATE AND FEDERAL REGULATORY REQUIREMENTS

8. Visible emissions from conveyors and transfer points must not exceed twenty percent (20%) opacity during normal operation of the source. During periods of startup, process modification, or adjustment of control equipment visible emissions must not exceed thirty percent (30%) opacity for more than six minutes in any sixty (60) consecutive minutes. (Reference: Regulation Number 1, Sections II.A.1. & 4.)

OPERATING AND MAINTENANCE REQUIREMENTS

9. This source is not required to follow a Division-approved operating and maintenance plan. The source must follow good air pollution control practices.

COMPLIANCE TESTING AND SAMPLING

Initial Testing Requirements

10. Initial testing is not required for this source.

Periodic Testing Requirements

11. Periodic testing is not required for this source.

ADDITIONAL REQUIREMENTS

12. The AIRS ID number must be posted in an easily-visible location for ease of identification. (Reference: Regulation Number 3, Part B, Section III.G.2.) (State-only enforceable)

13. The particulate emission control measures listed on the attached page (as approved by the Division) must be applied to the particulate emission-producing sources as required by Regulation Number 1, III.D.1.b.

14. This permit is for the activities specified above; any additional process equipment (i.e. crushers, screens, etc.) to be located at this site must have a separate permit from the Division as relevant. (Reference: Regulation Number 3, Part B, III.E)

15. A revised Air Pollutant Emission Notice (APEN) must be filed: (Reference: Regulation Number 3, Part A, Section II.C.)

    a. By April 30 of the year following a significant increase in emissions. A significant increase in emissions is defined as follows:

       For any criteria pollutant:

       For sources emitting **less than one hundred (100) tons per year**, a change in actual emissions of five (5) tons per year or more, above the level reported on the last APEN submitted; or

       For volatile organic compounds (VOC) and nitrogen oxide (NOx) sources in an ozone non-attainment area emitting **less than one hundred (100) tons of VOC or nitrogen oxides per year**, a change in actual emissions of one (1) ton per year or more or five percent (5%), whichever is greater, above the level reported on the last APEN submitted; or

       For sources emitting **one hundred (100) tons per year or more** of a criteria pollutant, a change in actual emissions of five percent (5%) or fifty (50) tons per year or more, whichever is less, above the level reported on the last APEN submitted; or

       For sources emitting **any amount of lead**, a change in actual emissions, above the level reported on the last APEN submitted, of fifty (50) pounds of lead

       For any non-criteria reportable pollutant:

       If the emissions increase by fifty percent (50%) or five (5) tons per year, whichever is less, above the level reported on the last APEN submitted to the Division.

    b. Whenever there is a change in the owner or operator of any facility, process, or activity.

c. Whenever new control equipment is installed, or whenever a different type of control equipment replaces an existing type of control equipment.

d. Whenever a permit limitation must be modified.

e. No later than thirty (30) days before the existing APEN expires.

GENERAL TERMS AND CONDITIONS

16. This permit and any attachments must be retained and made available for inspection upon request. The permit may be reissued to a new owner by the Division as provided in Regulation Number 3, Part B, Section II.B. upon a request for transfer of ownership and the submittal of a revised APEN and the required fee.

17. If this permit specifically states that final approval has been granted, then the remainder of this condition is not applicable. Otherwise, the issuance of this construction permit is considered initial approval and does not provide "final" approval for this activity or operation of this source. Final approval of the permit must be secured from the APCD in writing in accordance with the provisions of 25-7-114.5(12)(a) C.R.S. and AQCC Regulation Number 3, Part B, Section III.G. Final approval cannot be granted until the operation or activity commences and has been verified by the APCD as conforming in all respects with the conditions of the permit. Once self-certification of all points has been reviewed and approved by the Division, it will provide written documentation of such final approval. Details for obtaining final approval to operate are located in the "Requirements to Self-Certify for Final Approval" section of this permit. The operator must retain the permit final approval letter issued by the Division after completion of self-certification with the most current construction permit.

18. This permit is issued in reliance upon the accuracy and completeness of information supplied by the applicant and is conditioned upon conduct of the activity, or construction, installation and operation of the source, in accordance with this information and with representations made by the applicant or applicant's agents. It is valid only for the equipment and operations or activity(ies) specifically identified in this permit. If subsequent operations or testing at the source indicate the information supplied to obtain this permit and relied upon in the creation and issuance of this permit is inaccurate, the source must submit an application to modify the permit to address the inaccuracy(ies). (Reference: Regulation Number 3, Part B, Section III.E.)

Permit History

Issuance	Date	Description
Issuance 1	This Issuance	Issued to Bennett Creek Ranch, LLC. as initial approval to operate.

NOTES TO PERMIT HOLDER (AS OF DATE OF PERMIT ISSUANCE)

1) The production or raw material processing limits and emission limits contained in this permit are based on the production/processing rates requested in the permit application. These limits may be revised upon request of the permittee providing there is no exceedance of any specific emission control regulation or any ambient air quality standard. A revised air pollutant emission notice (APEN) and application form must be submitted with a request for a permit revision. (Reference: Regulation Number 3, Part B, Section II.A.4.)

2) This source is subject to the Common Provisions Regulation Part II, Subpart E, Affirmative Defense Provision for Excess Emissions During Malfunctions. The permittee must notify the Division of any malfunction condition which causes a violation of any emission limit or limits stated in this permit as soon as possible, but no later than noon of the next working day, followed by written notice to the Division addressing all of the criteria set forth in Part II.E.1. of the Common Provisions Regulation.

3) In accordance with C.R.S. 25-7-114.1, each Air Pollutant Emission Notice (APEN) associated with this permit is valid for a term of five (5) years from the date it was received by the Division. A revised APEN must be submitted no later than thirty (30) days before the five-year term expires. Please refer to the most recent annual fee invoice to determine the APEN expiration date for each emissions point associated with this permit. For any questions regarding a specific expiration date call the Division at (303)-692-3150.

4) This facility is classified as follows:

Applicable Requirement	Status
Operating Permit	Minor Source
PSD	Minor Source

5) The permit holder is required to pay fees for the processing time for this permit. An invoice for these fees will be issued after the permit is issued. Failure to pay the invoice will result in revocation of this permit. The permit holder must pay the invoice within thirty (30) days of receipt of the invoice. (Reference: Regulation Number 3, Part A, Section VI.B.)

6) Unless specifically stated otherwise, the general and specific conditions contained in this permit have been determined by the Division to be necessary to assure compliance with the provisions of Section 25-7-114.5(7)(a), C.R.S.

7) Each and every condition of this permit is a material part hereof and is not severable. Any challenge to or appeal of a condition hereof must constitute a rejection of the entire permit and upon such occurrence, this permit must be deemed denied ab initio. This permit may be revoked at any time prior to self-certification and final authorization by the Division on grounds set forth in the Colorado Air Pollution Prevention and Control Act and regulations of the AQCC including failure to meet any express term or condition of the permit. If the Division denies a permit, conditions imposed upon a permit are contested by the applicant, or the Division revokes a permit, the applicant or owner or operator of a source may request a hearing before the AQCC for review of the Division's action. (Reference: Regulation Number 3, Part B, Section III.F.)

8) Section 25-7-114.7(2)(a), C.R.S. requires that all sources required to file an Air Pollutant Emission Notice (APEN) must pay an annual emission fee. If a source or activity is to be discontinued, the owner must notify the Division in writing requesting a cancellation of the permit. Upon notification, annual fee billing will terminate.

9) Violation of the terms of a permit or of the provisions of the Colorado Air Pollution Prevention and Control Act or the regulations of the AQCC may result in administrative, civil or criminal enforcement actions under Sections 25-7-115 (enforcement), -121 (injunctions), -122 (civil penalties), -122.1 (criminal penalties), C.R.S

PARTICULATE EMISSIONS CONTROL PLAN FOR MATERIAL PROCESSING ACTIVITIES

THE FOLLOWING PARTICULATE EMISSIONS CONTROL MEASURES MUST BE USED FOR COMPLIANCE PURPOSES ON THE ACTIVITIES COVERED BY THIS PERMIT, AS REQUIRED BY THE AIR QUALITY CONTROL COMMISSION REGULATION NUMBER 1, III.D.1.b. THIS SOURCE IS SUBJECT TO THE FOLLOWING EMISSION GUIDELINES:

1) Processing Activities - Visible emissions not to exceed twenty percent (20%) opacity, no off-property transport of visible emissions.

2) Haul Roads - No off-property transport of visible emissions must apply to on-site haul roads, the nuisance guidelines must apply to off-site haul roads.

3) Haul Trucks - There must be no off-property transport of visible emissions from haul trucks when operating on the property of the owner or operator. There must be no off-vehicle transport of visible emissions from the material in the haul trucks when operating off of the property of the owner or operator.

Control Measures

1. Adequate soil moisture must be maintained in topsoil and overburden to control emissions during removal. Watering must be implemented if necessary.

2. Topsoil and overburden stockpiles must be compacted and revegetated within one (1) year.

3. Emissions from material handling (i.e. removal, loading, and hauling) must be controlled by watering at all times unless natural moisture is sufficient to control emissions.

4. Unpaved haul roads must be graveled, treated with chemical stabilizer per manufacturer's recommendations, and watered as often as needed to control fugitive particulate emissions such that the above guidelines are met.

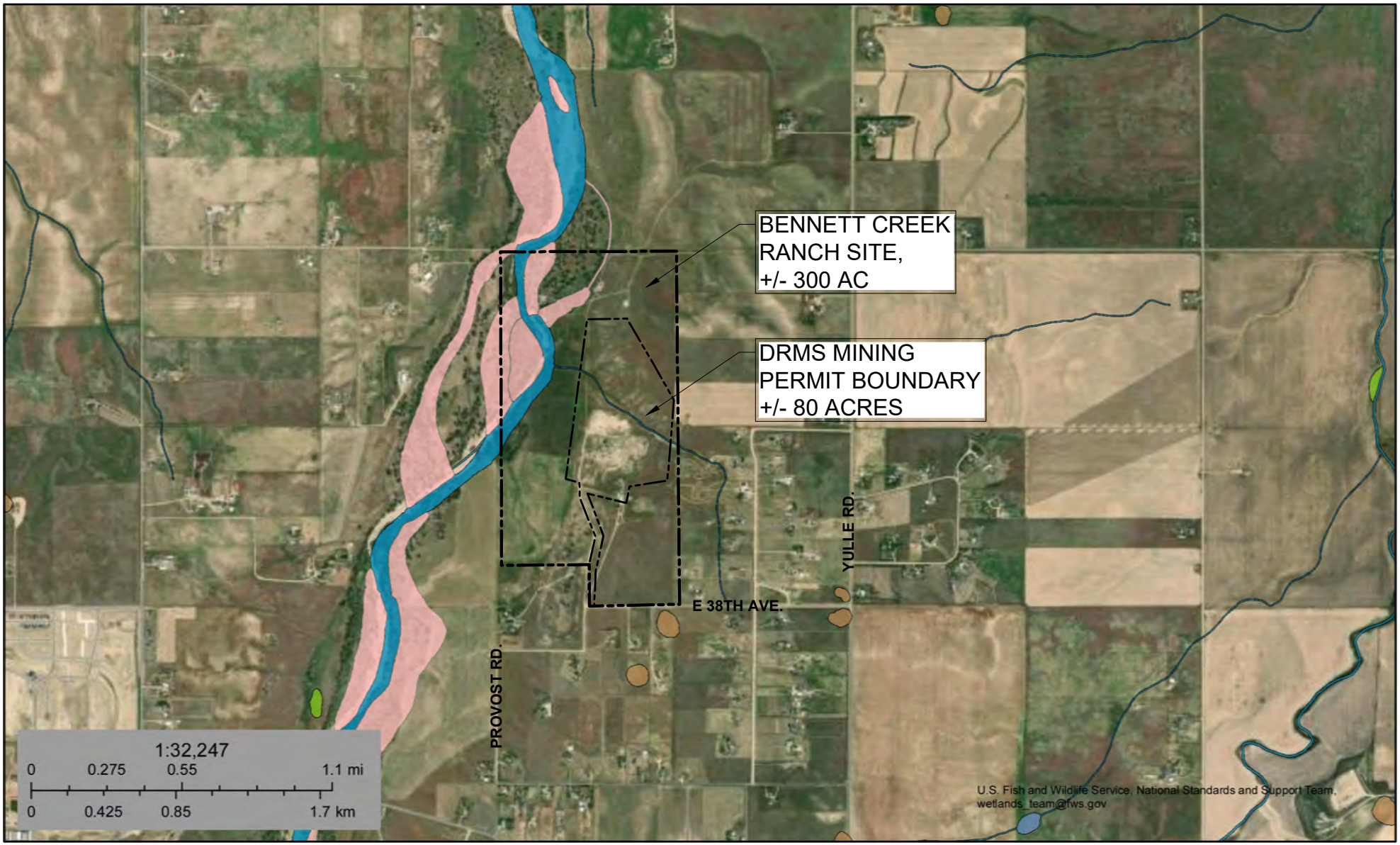
5. Reclamation works and sequential extraction of material must be initiated to keep the total disturbed areas at any one time to a minimum.

6. All disturbed areas must be treated with chemical stabilizer per manufacturer's recommendations, and watered as often as needed to control fugitive particulate emissions such that the above guidelines are met, and revegetated within one (1) year.

U.S. Fish and Wildlife Service

National Wetlands Inventory

Bennett Creek Ranch Wetland



March 4, 2026

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

COLORADO
Air Pollution Control Division
Department of Public Health & Environment

Environmental Justice Verification Number: 85951849

Benjamin Langenfeld
Dig Boss Excavating
Thornburg Pit
Census Block Group: 080010084021

November 25, 2024

Dear Benjamin Langenfeld,

We have reviewed the complete Environmental Justice Summary submitted on November 21, 2024 for the Thornburg Pit facility in Census Block Group 080010084021. Based on this information, the facility is not located in a Disproportionately Impacted Community. You can now move forward with submitting your permit application to the Air Pollution Control Division.

Please include this full document as part of your permit application package. It includes the Environmental Justice Summary information you submitted, as well as this letter of concurrence. The Environmental Justice Summary is part of the permit record. If the main permit application does not include this letter of concurrence and the information attached, it may be rejected as incomplete.

Please note: Sources with any quantifiable amount of **new or modified emissions** of nitrogen oxides (NO_X), sulfur dioxide (SO_2), particulate matter ≤2.5 microns in diameter ($PM_{2.5}$), carbon monoxide (CO), or BTEX (benzene, toluene, ethylbenzene, and/or xylene) must also submit APCD Form-114 to the Permit Modeling Unit **prior** to submitting their permit application. Learn more about when APCD Form-114 is required and explore Colorado modeling guidance for air quality permits.

If you have any questions about the Environmental Justice Summary, please email cdphe_apcd_ejreports@state.co.us.

Thank you,

Air Pollution Control Division's Environmental Justice in Permitting Team
Colorado Department of Public Health and Environment

For internal use only

Number of hours spent on Environmental Justice Summary review and approval: 0.5 hours.

COLORADO
Air Pollution Control Division
Department of Public Health & Environment

Section 1: Background Information (Company/Facility)

1. Company Name

   Dig Boss Excavating

2. Facility Name

   Thornburg Pit

3. Facility Address

   ,

4. Facility Latitude 39.77345

5. Facility Longitude -104.3898

6. Census Block Group(s) in Which the Facility is Located
   080010084021
7. Which Type of Air Permit Will You Be Applying For?
   Construction Permit
8. What specific outcomes or changes will result from the requested permitting action? An increase in emissions
9. Has This Facility Previously Received an Official Permit or Exemption Letter from the Air Pollution Control Division (APCD)?

10. What is the AIRS ID of this facility?

11. What is the permit number exemption number?

Section 2: Environmental Justice Requirements

1. Based on the Environmental Justice Report Generated, is this Facility Located in a Disproportionately Impacted (DI) Community?

No

2. What type of Disproportionately Impacted (DI) Community is the facility located in based on the Environmental Justice Report?
   Non-DIC

Section 3: Description of Proposed Permit Application

1. Is the facility an Affected Construction Source?
   No

2. Will this facility emit any Affected Pollutants?
   Particulate matter ≤2.5 microns in diameter (PM2.5)

3. Provide a brief description of the proposed permit application.
   Excavation of sand and gravel for construction materials

4. Based on the results of the facility's Environmental Justice Report results and/or engagement with the Disproportionately Impacted Community, describe any:

   a. Mitigation measures;

   b. Emission reduction and control strategies; N/A
      and/or
   c. Changes made to the originally planned source equipment or operations.

Section 4: Public Outreach

1. Did the owner/operator of the facility conduct enhanced community outreach to the impacted community prior to submitting the main permit application?
   No

a. If the option "Planned, in progress, or to be determined" is chosen: describe any measures that are planned, in progress, or to be determined.

Part 1: Know the audience, community, and purpose

1. Did you contact residents within at least one-mile radius of the facility to notify them about the proposed permit or project and how they can provide feedback?

2. Did you contact and/or coordinate with any of the following types of organizations or individuals to understand local audiences and the most effective ways to reach them? (Select all that apply.)

3. (Optional) Provide any additional information about the audience, community, and purpose. Also provide the name of any organizations contacted:

Part 2: Host public meetings at various times and days

1. Meeting date:

2. Meeting time:

3. Meeting type: (Select all that apply.)

4. Meeting location(s) (venue name, street address and/or coordinates):

5. Number of registered participants:

6. Number of public participants and community members in attendance:

Part 3: Host public meeting(s) in locations that are safe and accessible

1. If the facility hosted in-person or hybrid meetings, did you choose locations that were: (Select all that apply)

2. Location accessibility- the location was accessible by: (Select all that apply.)

3. Did you publish meeting and presentation materials on a publicly accessible website?

    a. If yes, please add a link to the website.

4. Did you use a facilitator to keep the meeting on track?

5. (Optional) Provide any additional information about hosting considerations:

Part 4: Provide at least 30 days' notice ahead of public meetings

1. Did you provide at least 30 days' notice ahead of public meetings?
2. Did you provide at least one reminder in advance of the meeting?

Part 5: Actively promote outreach and public participation opportunities

1. Communication tactics used for promoting meetings: (Select all that apply.)
2. Were any of the communication tactics provided in multiple languages?
3. If you selected “yes” to the previous question, please list the languages used in communication tactics and why they were chosen:
4. Did you attend community events or collaborate with trusted partners and organizations to share updates, messages, and public meeting information?

5. (Optional) Provide any additional information about outreach and activities:

Part 6: Ensure language justice, cultural competency, and accessibility in outreach materials

1. Were meetings made available in multiple languages (interpretation services provided for non-English speakers?)

2. Were meeting materials translated into multiple languages?

3. If interpreters were used, please note the vendor who provided the interpretation:

4. If translation was used, please note the vendor who provided the translation:

5. Were digital accessibility best practices used for web content, digital fliers, social media posts, or other digital communications?

6. (Optional) Provide any additional information about accessibility considerations:

Part 7: Provide various and accessible methods for receiving public feedback

1. Which of the following opportunities and platforms were provided for the public to provide feedback? (Select all that apply).

2. Number of public feedback comments received in writing:

3. Number of public feedback comments received verbally:

4. How did you review public feedback received and use it to inform the proposed project?

5. (Optional) Provide any additional information about public comments received and considered:

Part 8: Reduce barriers to participation via participation stipends, childcare services, and more

1. Provided for public meeting attendees: (Select all that apply).

2. Included in the public meeting: (Select all that apply).

3. (Optional) Provide a short description of the activities conducted, methods used, and any additional information about reducing barriers for the community:

COLORADO
Air Pollution Control Division
Department of Public Health & Environment

Air Quality Regulation (Reg.) 3

Environmental Justice Report

Applicant Information

Company Name: Dig Boss Excavating

Facility Name: Thornburg Pit

Plant AIRS ID Number:

Permit Type:

Permit Number:

Facility location used for generating the report: 39.77345 , -104.3898

Environmental Justice Summary

Adams County

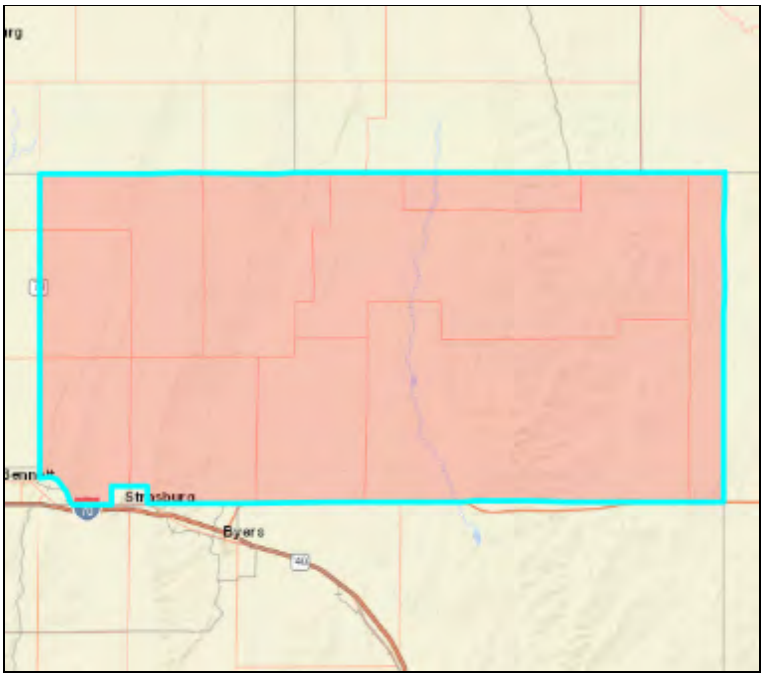
Census Block Group 080010084021

Air Quality Reg. 3 Disproportionately Impacted (DI) Community

No

Air Quality Reg. 3 Community Type

Not Disproportionately Impacted



Low-income Population	22.8%
People of Color Population	13%
Limited English Proficiency Population	0.6%
Housing Cost Burdened Population	23.2%
CO EnviroScreen Percentile Score	27.86

Environmental Justice Overview

Environmental Exposures Percentile Score 9.6

The environmental exposures score represents a community's exposure to certain environmental risks relative to the rest of the state. The score ranges from 0 to 100, with higher scores indicating higher burden. The environmental exposures score does not cover all pollutants; it is the average of data on diesel particulate matter, traffic proximity, ozone, PM 2.5, air toxics, other air pollutants, lead exposure risk, drinking water violations, and noise.

Environmental Effects Percentile Score 15.49

The environmental effects score represents how many hazardous or toxic sites are in a community relative to the rest of the state. The score ranges from 0 to 100, with a higher score indicating higher burden. The score is the average of data on proximity to mining, oil and gas operations, impaired surface waters, wastewater discharge facilities, Superfund sites, facilities that use hazardous chemicals, and facilities that generate, treat, store, or dispose of hazardous wastes.

Climate Vulnerability Percentile Score 28.91

The climate burden score represents a community's risk of drought, flood, extreme heat, and wildfire compared to the rest of the state. The score ranges from 0 to 100, the higher the score, the higher the burden.

Sensitive Populations Percentile Score 84.43

The sensitive populations score captures how at risk a community is to environmental exposures and climate impacts as it relates to health. For example, air pollution has stronger impacts on older and younger people, and people with chronic conditions such as asthma. The score ranges from 0 to 100, with a higher score being worse. The score is calculated using data on asthma hospitalization rate, cancer prevalence, diabetes prevalence, heart disease prevalence, life expectancy, low birth weight rate, mental health, population over 65, and population under 5.

Demographics Percentile Score 35.28

The demographics score represents a community's social and economic vulnerabilities. The score ranges from 0 to 100, with a higher number representing a higher vulnerability. It is calculated using data on people living with disabilities, housing cost burden, educational attainment, limited English proficiency, income, and race and ethnicity.

One-mile radius with satellite imagery for facility: Thornburg Pit



Image above notes a one-mile radius from the location in the center of the circle.

One-mile radius around location used to generate report

An aerial or satellite image of the facility, including a one-mile radius of the surrounding area, is a required component for the Environmental Justice Summary.

This image was generated from the Environmental Justice Report Tool for Air Quality Regulation 3 using the ESRI World imagery basemap. The map features Maxar imagery at 0.3m resolution for select metropolitan areas around the world and 0.5m resolution across the United States. In addition to commercial sources, the World Imagery map features high-resolution aerial photography contributed by the GIS User Community. This imagery ranges from 0.3m to 0.03m resolution (down to ~1:280 in select communities).

For more information, visit: World Imagery

Pollution and Climate Indicators

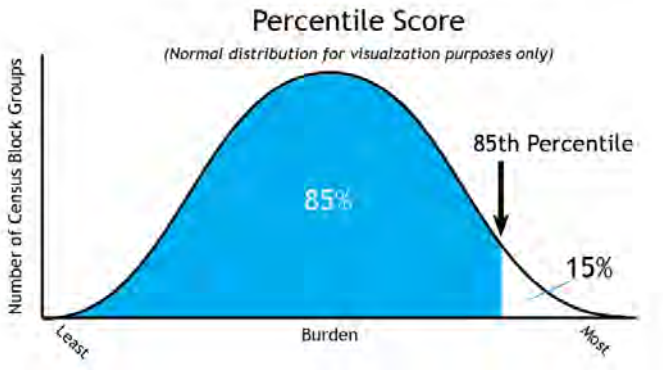
Indicator	Original Unit of Measure	Percentile
Air Toxics Emissions	distance weighted measure of estimated air toxics emissions	96.01
Diesel Particulate Matter	micrograms per cubic meter	16.57
Drinking Water Regulations	population weighted duration (in weeks) of resolved and unresolved health based violations from active community public water systems	13.48
Fine Particle Pollution (PM 2.5)	micrograms per cubic meter	37.2
Impaired Streams and Rivers	average impairment and assessment status of streams	29.41
Lead Exposure Risk	percentage of housing units built before 1960, as an indicator of potential exposure to lead	55.58
Noise	decibles A	13.79
Other Air Pollutants	distance weighted measure of estimated other air pollutant emissions	93.57
Ozone	parts per billion	19.11
Proximity to Hazardous Waste Facilities	distance weighted count of hazardous waste facilities within 5 km	13.65
Proximity to Mining Locations	distance weighted measure of the total number of active coal, hard rock, and construction materials mining permits	95.61
Proximity to National Priorities List Sites	distance weighted count of proposed or listed NPL sites with 5 km	34.82
Proximity to Oil and Gas	distance weighted measure of the total number of active oil and gas locations	98.73
Proximity to Risk Management Plan Sites	distance weighted count of RMP facilities within 5 km	56.68
Traffic Proximity and Volume	amount of vehicular traffic nearby, and distance from roads	2.46
Wastewater Discharge Indicator	toxic chemical concentrations in stream segments per km	5.98
Drought	sum of weekly total percent of an area experiencing a severe, extreme, or exceptional drought	30.29
Extreme Heat Days	average number of high heat days between May and September from 2016 to 2020	50.54
Floodplains	percentage of each geographic area where there is at least a one percent chance of flooding annually	70.1
Wildfire Risk	mean wildfire hazard potential within each geographic area as determined by the US Forest Service, 2021	34.82

Health and Social Indicators

Indicator	Orignial Unit of Measure	Percentile
Asthma Hospitalization Rate	rate of hospitalization per 100,000 people	78.59
Cancer Prevalence	percent of adults	56.37
Diabetes Prevalence	percent of adults	52.71
Heart Disease in Adults	percent of adults	83.45
Life Expectancy	years	74.98
Low Birth Weight	percent of singleton births	57.72
Mental Health Indicator	percent of adults	43.04
Population over 64 years of age	percent of total population	35.73
Population under 5 years of age	percent of total population	54.59
Disability	percent of total population	20.16
Housing Cost Burdened	percent of total population	30.83
Less Than High School Education	percent of total population	51.5
Linguistic Isolation	percent of total population	55.24
Low Income	percent of total population	48.7
People of Color	percent of total population	23.92

Understanding the Data

The values shown in the Pollution and Climate Indicator and Health and Social Indicator tables are percentiles. Percentiles are a way to see how one area compares to other areas in Colorado. Percentile values range from 0 - 100. A higher score indicates higher burden. Specifically, the percentile tells you the percentage of places in Colorado that have a lower score than the selected location. For example, an area with 85 percentile score for the noise indicator, ranks in the top 15% of areas impacted by noise in Colorado. That means that 85% of the other Census Block Groups in Colorado have a lower score for noise impacts.



The data in the report comes from Colorado EnviroScreen version 1.0. Developed in 2022 by CDPHE and Colorado State University, EnviroScreen maps the overlap of environmental exposures and effects, climate vulnerability, sensitive populations, and demographics to better understand environmental injustice and environmental health risks in Colorado. For more detailed information on the data sources used in Colorado EnviroScreen Version 1.0 see the technical documentation.

On the first page of the report, red text highlights if values for a census block group meet or exceed the criteria for definition of Disproportionately Impacted Community for Air Quality Regulation 3. On subsequent pages of the report, red text highlights indicators in the top percentiles for Colorado that may warrant additional consideration during the permitting process. The Environmental Justice Report is not intended to show individual health risk or exposure.

In the Environmental Justice Summary on the first page, values shown in red indicate a census block group that meets or exceeds the following criteria to qualify as a Disproportionately Impacted (DI) Community for Air Quality Reg 3:

- Over 40% of households are low-income (meaning they are at or below 200% of the federal poverty level),
- Over 40% of the population identify as people of color,
- Over 50% of households are housing-cost burdened (meaning they spend more than 30% of household income on housing costs), or
- Over 20% of the population is linguistically isolated (meaning no adults in a household speak English well).

A census block group that meets or exceeds any of these percentages is labeled as a Socioeconomically Vulnerable Community (SVC).

The CO EnviroScreen Percentile Score, which is also found on the first page of the Environmental Justice Report, is written in red if it is above the 80th percentile. A census block group with a CO EnviroScreen Score above the 80th percentile is labeled as a Cumulatively Impacted Community (CIC).

In other sections of the Environmental Justice Report, including the Environmental Justice Overview, Pollution and Climate Indicators, and Health and Social Indicators sections, indicator and component scores over the 80th percentile

are also highlighted in red. The 80th percentile threshold is used in most cases to flag census block groups that have indicators and groups of indicators (components) that are in the top 20% of census block groups in Colorado. These indicators and components are flagged because they may warrant further review in the permitting process by the permit applicant and/or the Division staff reviewing the permit.

For most indicators, the indicator is highlighted in red if it is above the 80th percentile to indicate that the census block group where the facility is located faces higher risks based on that indicator compared to other Colorado communities. However, less than 20% of census block groups in Colorado have oil and gas facilities or mining locations. Accordingly, all census block groups in Colorado score above the 80th percentile for proximity to these two types of facilities because even having zero facilities puts a community in the top 20%. Accordingly, the Environmental Justice Report highlights a census block group in red if it is above the 85th percentile for mining facilities and above the 90th percentile for oil and gas facilities. This ensures that only census block groups with a greater number of facilities than the statewide average of zero are highlighted on the EJ Report.

Colorado EnviroScreen does:

-Show which areas in Colorado are more likely to have higher environmental health injustices.
-Identify areas in Colorado where government agencies can prioritize resources and work to reduce pollution and other sources of environmental injustice.
-Provide information to empower communities to advocate to improve public health and the environment.
-Identify areas that meet the updated definition of "Disproportionately Impacted Community" under House Bill 23-1233 adopted a definition that applies to all state agencies, including CDPHE.
-Identify areas where the Air Quality Regulation (Reg.) Number 3, which governs permitting in disproportionately impacted communities, applies.
-Identify areas that meet the prior definition of "Disproportionately Impacted Community" under the Colorado Environmental Justice Act (HB21-1266).

Colorado EnviroScreen does not:

-Define a healthy or unhealthy environment.
-Establish causal associations between environmental risks and health.
-Define all areas that may be affected by environmental injustice or specific environmental risks.
-Provide information about an individual person's health status or environment.
-Take all environmental exposures into account.
-Tell us about smaller areas within a census block group that may be more vulnerable to environmental exposures than other areas.
-Provide information about non-human health or ecosystem risks.

Additional Resources

Frequently Asked Questions: Environmental Justice Report Tool for Air Quality Regulation 3

Air Pollution Control Division's Small Business Assistance Program

CDPHE Environmental Justice Program

Colorado EnviroScreen Version 1.0 Reports, Guides, and Resources Folder

ANNUAL EMISSIONS

	Uncontrolled (tpy)			Controlled (tpy)		
Emissions Source	TSP	PM10	PM2.5	TSP	PM10	PM2.5
Topsoil Removal	0.0	0.0	0.0	0.0	0.0	0.0
Topsoil Stockpile	0.0	0.0	0.0	0.0	0.0	0.0
Overburden Removal	0.0	0.0	0.0	0.0	0.0	0.0
Overburden Stockpile	0.0	0.0	0.0	0.0	0.0	0.0
Drilling Operations	0.0	0.0	0.0	0.0	0.0	0.0
Blasting Operations (PM only)	0.0	0.0	0.0	0.0	0.0	0.0
Raw Material Removal	0.3	0.2	0.0	0.1	0.1	0.0
Raw Material Stockpile	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Hopper Loading	0.0	0.0	0.0	0.0	0.0	0.0
Crushing	0.0	0.0	0.0	0.0	0.0	0.0
Screening	0.0	0.0	0.0	0.0	0.0	0.0
Conveyors & Transfer Points	0.0	0.0	0.0	0.0	0.0	0.0
Product Stockpiles	0.0	0.0	0.0	0.0	0.0	0.0
All Disturbed Areas	25.4	12.0	1.8	0.2	0.1	0.0
Raw Material Transport	0.9	0.2	0.0	0.0	0.0	0.0
Finished Product Transport	8.5	2.3	0.2	0.2	0.1	0.0
Total Pit Fugitive Emissions	35.2	14.9	2.1	0.6	0.3	0.1
Total Materials Processing Emissions	0	0	0	0	0	0
Total Pit Point Emissions	0	0	0	0	0	0
Total Overall Emissions	**35.2**	**14.9**	**2.1**	**0.6**	**0.3**	**0.1**

DAILY/HOURLY EMISSIONS

	Controlled lb/day			Controlled lb/hour		
Emissions Source	TSP	PM10	PM2.5	TSP	PM10	PM2.5
Topsoil Removal	0.8	0.4	0.1	0.1	0.0	0.0
Topsoil Stockpile	0.0	0.0	0.0	0.0	0.0	0.0
Overburden Removal	3.4	0.0	0.0	0.3	0.0	0.0
Overburden Stockpile	0.0	0.0	0.0	0.0	0.0	0.0
Drilling Operations	0.0	0.0	0.0	0.0	0.0	0.0
Blasting Operations (PM only)	0.0	0.0	0.0	0.0	0.0	0.0
Raw Material Removal	8.3	6.2	0.1	0.7	0.5	0.0
Raw Material Stockpile	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Hopper Loading	0.0	0.0	0.0	0.0	0.0	0.0
Crushing	0.0	0.0	0.0	0.0	0.0	0.0
Screening	0.0	0.0	0.0	0.0	0.0	0.0
Conveyors & Transfer Points	0.0	0.0	0.0	0.0	0.0	0.0
Product Stockpiles	0.0	0.0	0.0	0.0	0.0	0.0
All Disturbed Areas	1.0	0.5	0.1	0.1	0.0	0.0
Raw Material Transport	0.9	0.2	0.0	0.1	0.0	0.0
Finished Product Transport	33.9	9.3	0.9	2.8	0.8	0.1
Total Pit Fugitive Emissions	14.4	7.3	0.3	1.2	0.7	0.1
Total Materials Processing Emissions	0	0	0	0	0	0
Total Pit Point Emissions	0	0	0	0	0	0
Total Overall Emissions	**48.3**	**16.6**	**1.3**	**4.1**	**1.4**	**0.2**

Bennett Creek Ranch – Level III Storm Drainage Study

August 31, 2025

By:

Bennett Creek Ranch, LLC

Represented by:

Lewicki & Associates

Project Information	
Project Name	Thornburg Pit (Bennett Creek Ranch Gravel Pit)
Property Owner/Developer	Bennett Creek Ranch LLC
Owner Contact	John Wakeham, 720-335-1874, Digbossjohn@gmail.com
Property Address	4545 Yulle Rd, Bennett, CO 80102
Engineer of Record	Ben Langenfeld, PE, Lewicki & Associates
Engineer Contact	720-842-5321 x1, benl@lewicki.biz
Parcel IDs	0181500000058, 0181524200001
Total Property Size	±300 acres
Mining Area	±78 acres
Current Zoning	A-3 (Agricultural)

PE Certification Statement and Stamp

I hereby certify that this report for the Level III Drainage design of Thornburg Pit was prepared by me or under my direct supervision in accordance with the provisions of Adams County Storm Drainage Design and Technical Criteria for the owners thereof. I understand that Adams County does not and will not assume liability for drainage facilities designed by others.



Developer Certification of Drainage Facilities

Bennett Creek Ranch, LLC hereby certifies that the drainage facilities for Bennett Creek Ranch shall be constructed according to the design presented in this report. I understand that Adams County does not and will not assume liability for the drainage facilities designed and/ or certified by my engineer.

I understand that Adams County reviews drainage plans pursuant to Colorado Revised Statues Title 30, Article 28; but cannot, on behalf of Bennett Creek Ranch , guarantee that final drainage design review will absolve Bennett Creek Ranch, LLC and/ or their successors and/ or assigns the future liability for improper design. I further understand that approval of the Final Plat and/ or Final Development Plan does not imply approval of my engineer's drainage design."

_____

Date

_____

Name of Developer (please print)

_____

Authorized Signature

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Project Description

1. Project Overview

This Level III Drainage Study has been prepared in accordance with Adams County Storm Drainage Criteria Manual, Chapter 9 (2021). The purpose of this study is to provide a complete hydrologic and hydraulic analysis for the Thornburg Pit, a renewal of conditional use permit for an existing sand and gravel mining operation operated by Bennett Creek Ranch LLC.

The project details include a Conditional Use Permit Renewal (PRE-2025-00025) for existing sand and gravel mining operations that have functioned for decades. The total property encompasses ±300 acres (Parcels 0181500000058 and 0181524200001) with the active mining area covering ±78 acres centrally located with minimum 25-foot setbacks from property boundaries. The land use designation is mineral extraction under A-3 zoning which allows mining as a conditional use, with an estimated operation duration of 20-30 years.

1.1. Mining Operations and Reclamation Summary

The Thornburg Pit represents continuation of an existing mining operation that has functioned for decades under current DRMS Mining Permit #M1983060. The mining activities will create a temporary increase in impervious area through disturbed soils, haul roads, and operational areas within the ±78-acre mining boundary over the 20-30 year operational period. However, the project includes a comprehensive reclamation commitment requiring complete restoration within 180 days of mining completion per DRMS requirements. The final reclamation will restore the site with native shortgrass prairie vegetation consistent with the original A-3 agricultural zoning, resulting in zero percent net increase in impervious area and return to natural drainage patterns. This temporary mining use with mandatory restoration ensures that the long-term impact to site hydrology will be eliminated through professional reclamation to pre-development conditions.

Please see the vicinity map that is attached.

2. Existing Conditions

2.1. Site Description

The Thornburg Pit is located on Bennett Creek Ranch LLC property, approximately 2 miles northeast of Bennett, Colorado. The total property encompasses ±300 acres with the active mining area covering ±78 acres centrally located with minimum 25-foot setbacks from all property boundaries.

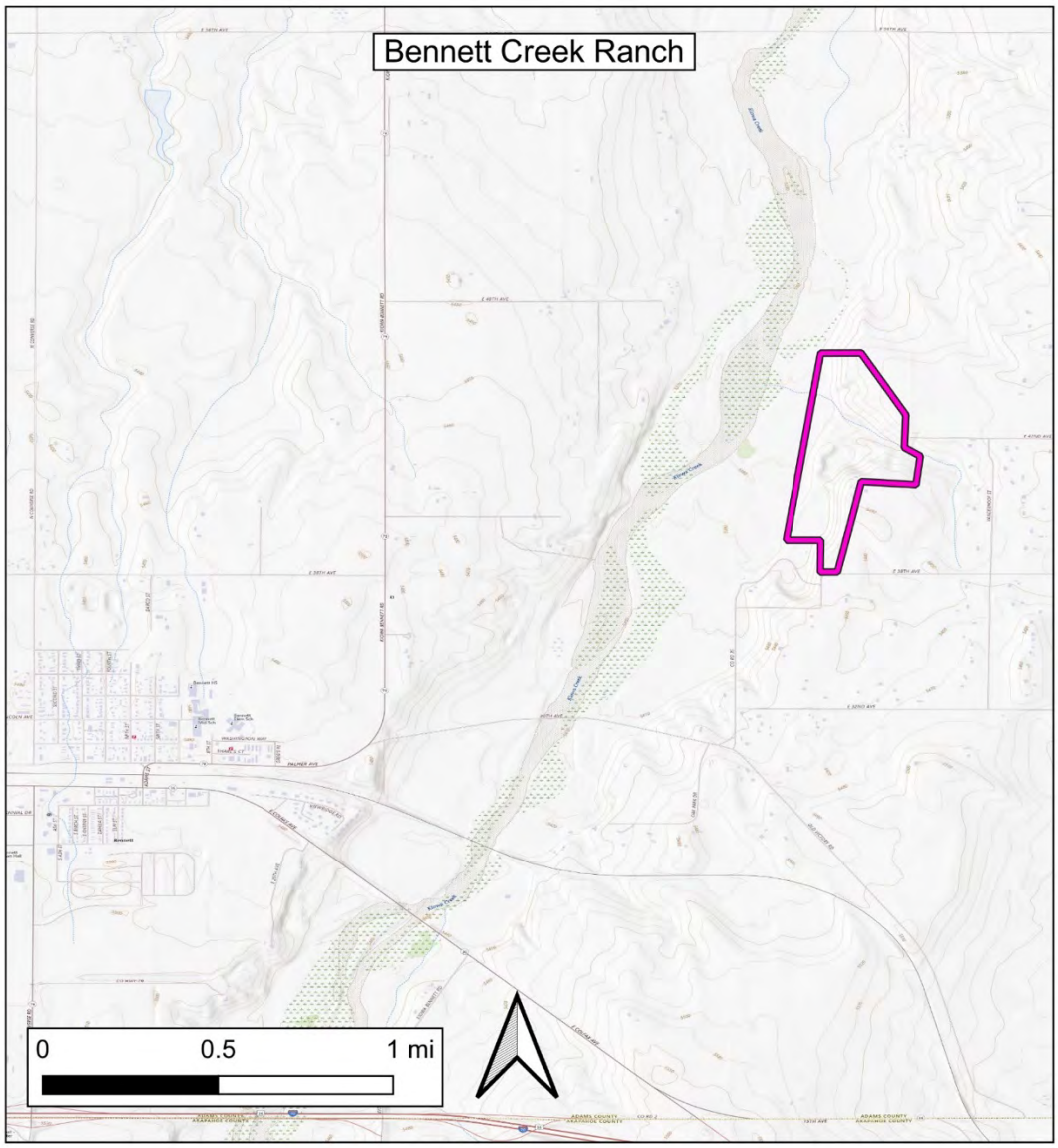


Figure 1. Location Map

The site has functioned as an active mining and extraction site for decades, with the current renewal representing continuation of long-standing mining activities. Portions of the mining area show existing disturbance from ongoing operations. The applicant's personal residence is adjacent to the property, ensuring immediate awareness of any operational impacts.

2.2. Current Site Conditions

Topography across the ±300-acre property is generally level with localized disturbed areas. The active mining area exhibits moderate grades oriented in east-west direction with existing open

pit excavation areas, berms, and private haul roads from ongoing operations. Surrounding areas maintain typical Plains Shortgrass Prairie ecosystem.

Existing mining infrastructure includes established haul roads connecting to Yulle Road and Old Victory Road, existing berms and stockpile areas, water management features from current operations, and operational equipment staging areas.

2.3. Drainage Patterns

Pre-disturbance runoff occurs primarily as sheet flow and shallow swales with drainage flowing west and northwest toward Kiowa Creek. No significant upstream inflows are anticipated to enter the project boundary, with existing drainage limited to on-site precipitation and surface runoff. Current operational drainage includes modified drainage patterns within active mining areas and temporary water management during ongoing operations.

2.4. Receiving Waters

Kiowa Creek serves as the primary receiving water, flowing along the western/northwestern edge of the ±300-acre property but not crossing into the ±78-acre mining permit boundary. The creek provides natural drainage outlet for site runoff with ultimate discharge to the South Platte River via Kiowa Creek.

2.5. Environmental Considerations

FEMA Flood Insurance Rate Maps identify 100-year Zone A floodplain of Kiowa Creek extending into portions of the overall property. The 25-foot minimum setbacks from property boundaries provide buffer from floodplain areas.

For flood analysis, see the Bennett Creek Ranch floodplain use permit.

3. Developed Site Drainage Conditions

3.1. Mining Operations Overview

The Thornburg Pit represents a continuation and formalization of existing mining operations rather than new development. The drainage analysis addresses three distinct phases: Pre-Development, Mining, and Reclamation conditions for the ±78-acre mining area within the ±300-acre property.

Following development, the Thornburg Pit site will be operated as an active sand and gravel mine. Land cover will transition from partially vegetated prairie and disturbed ground to a mix of open excavation areas, haul roads, processing areas, and stormwater management facilities. Impervious surfaces will remain limited, consisting primarily of compacted haul roads and staging areas. However, the extent of exposed and disturbed soils will increase runoff potential and reduce infiltration relative to existing conditions. Site grading, excavation, and the construction of haul roads will alter local slopes and concentrate drainage toward designed

collection points. Stormwater runoff will be conveyed by a combination of natural hillslopes, roadside ditches, and berms constructed along the private access road. Runoff from the site will be collected into three primary drainage basins and routed to extended detention basins (EDBs) sized to provide water quality treatment.

a. **Basin 1 (~27.6 ac):** Encompasses the southern portion of the DRMS permit boundary and drains westward into the proposed sand mine site and Kiowa Creek. Open pit excavation with active mining areas and berms already exists within this drainage basin.

b. **Basin 2 (~16.5 ac):** Encompasses the central portion of the DRMS permit boundary of the hillside that drains into the proposed sand mine site and due west towards Kiowa Creek.

c. **Basin 3 (~11 ac):** Encompasses the central portion of the DRMS permit boundary of the hillside that drains into the proposed sand mine site and due west towards Kiowa Creek

Each EDB is designed to capture the required Water Quality Capture Volume (WQCV) with a >40-hour drain down time. All three detention ponds ultimately discharge to Kiowa Creek, located along the western edge of the property. With these facilities in place, post-development peak flows will be controlled to at or below pre-development conditions, and water quality treatment will be provided in compliance with Adams County, State, and CDPHE requirements.

3.2. Three-Phase Analysis Approach

Pre-Development conditions include natural shortgrass prairie vegetation, original agricultural/open space land use, and natural drainage patterns and infiltration. Mining conditions involve all three mining pods actively disturbed, temporary increase in runoff from exposed soils and haul roads, and enhanced stormwater management systems operational. Reclamation conditions feature all three mining pods reclaimed and revegetated, return to native shortgrass prairie vegetation, and restoration of natural drainage patterns matching pre-development state.

3.3. Stormwater Management Strategy

The mining phase requires active stormwater management to handle increased runoff from disturbed areas through natural hillslopes and enhanced swales for primary conveyance, stormwater control berms around active mining areas for complete runoff containment, and Extended Detention Basins (EDBs) for water quality treatment.

3.4. Drainage Basin Configuration

The ±78-acre mining area has been analyzed as three primary drainage basins based on existing topography and operational requirements. Basin 1 encompasses approximately 27.6

acres in the southern portion of mining area with existing disturbance, containing established pit excavation and operational berms, draining westward toward Kiowa Creek via existing patterns. Basin 2 covers approximately 16.5 acres in the central portion of mining area with hillside drainage into operational areas and west-northwest drainage toward Kiowa Creek. Basin 3 encompasses approximately 11.0 acres in the northern portion of mining area with similar drainage patterns to Basin 2 and integration with overall site water management. The total contributing area represents ±55.1 acres of active drainage area within the ±78-acre mining boundary.

3.5. Water Quality Treatment System

Three EDBs are proposed to address mining phase water quality treatment with the purpose of Water Quality Capture Volume (WQCV) treatment with greater than 40-hour retention. The system operates through active management via pumping system with no spillways, integration coordinated with mining operations and equipment, and daily oversight by mining personnel. All EDBs will be backfilled and reclaimed upon operations cessation, representing temporary nature of the infrastructure.

The operational advantages include active personnel with mining staff available for daily monitoring and maintenance, equipment availability with on-site equipment supporting water management activities, professional oversight with environmental coordinator ensuring regulatory compliance, and immediate response capability with personnel available to address system needs immediately.

3.6. Final Reclamation Approach

Complete restoration includes final restoration target of 180 days after mining completion, vegetation goal of native shortgrass prairie matching pre-development conditions, drainage restoration returning to natural pre-development drainage patterns, long-term result of zero percent net increase in impervious area, and infrastructure removal with all EDBs backfilled and stormwater control berms removed.

The drainage evolution progresses from Pre-Development natural prairie conditions (baseline) to Mining Phase enhanced water management with temporary EDBs and stormwater control berms to Reclamation Phase complete restoration to natural drainage patterns.

The Drainage Basin Map is attached.

The drainage design accommodates the unique aspects of this mining operation while ensuring compliance with Adams County requirements and protection of Kiowa Creek water quality throughout the operational period and final reclamation.

Hydrologic Analysis

1. Analysis Method

Hydrologic analyses for the Thornburg Pit were completed using the UD-Rational Method (Version 2.0) in accordance with the Urban Storm Drainage Criteria Manual (USDCM) and Adams County Chapter 9 Storm Drainage Criteria Manual (2021). The analysis addresses three distinct phases: Pre-Development, Mining, and Reclamation conditions.

Design storm intensities are based on NOAA Atlas 14 values for the Bennett, CO area, with the site located approximately 2 miles northeast of Bennett, Colorado. Storm durations equal the critical duration which equals time of concentration (Tc) for each basin.

Time of concentration was estimated for each phase of development. Pre-Development phase includes natural prairie conditions with sheet flow, Mining Phase is modified by haul roads and disturbed areas, and Reclamation returns to natural conditions. Tc ranges from approximately 20 to 35 minutes across the three basins (Figure 2).

Runoff coefficients vary by condition and basin. Pre-Development conditions use 0.30-0.35 for all basins representing native shortgrass prairie conditions. Mining conditions use 0.65-0.80 for all basins reflecting all pods disturbed with exposed soils and haul roads. Reclamation conditions return to 0.30-0.35 for all basins with restored prairie vegetation matching pre-development.

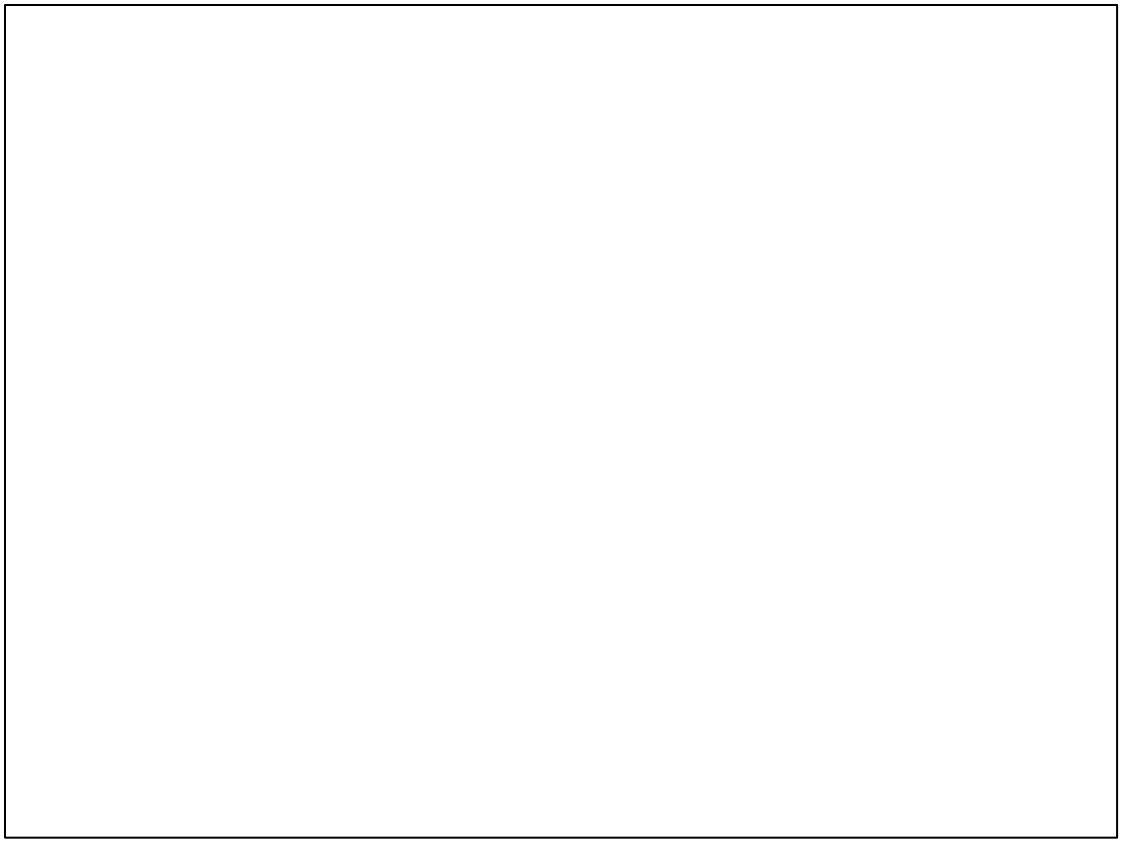


Figure 2. Drainage Basin Map

1.1. Three-Phase Analysis

The hydrologic analysis addresses three distinct operational phases. Phase 1: Pre-Development (Baseline) represents original prairie vegetation and natural infiltration with baseline flow conditions for comparison. Phase 2: Mining (Design Condition) includes all three mining pods actively disturbed representing maximum operational impact scenario requiring enhanced water management systems. Phase 3: Reclamation (Final Condition) features complete restoration with native vegetation, return to pre-development hydrology, and zero net increase in impervious area. Table 1 summarizes the storm event flows calculated using the Rational Method.

2. Peak Flow Analysis Results

2.1. Comprehensive Flow Summary

Table 1. Comprehensive Flow Summary

Storm Event	Pre-Development (cfs)	Mining (cfs)	Reclamation (cfs)
2-Year	26.28	45.74	26.28
5-Year	36.55	64.51	36.55

10-Year	47.16	81.74	47.16
100-Year	134.06	197.30	134.06

2.2. Individual Basin Analysis

Individual basin calculations are shown on the attached MHFD Rational Method sheet provided in Appendix A. These calculations detail individual basin flows for each phase and storm event, time of concentration calculations for each phase, composite runoff coefficients, and flow routing to outfall points.

3. Mining Phase

3.1. Hydrologic Impact Assessment

All three pods actively disturbed represents worst-case hydrologic condition. Increased runoff coefficients (0.65-0.80) reflect exposed soils and compacted surfaces. Enhanced runoff volumes require stormwater control berms for complete containment.

Stormwater Control Response includes stormwater control berms containing all storm events (minor and major) within mining areas, Extended Detention Basins providing water quality treatment with greater than 40-hour retention, and complete containment with no discharge during storm events and controlled pumping afterward.

3.2. 4.5.2 Water Quality Considerations

Mining Phase creates increased potential for sediment generation from exposed soils. Treatment Response includes enhanced water treatment systems (EDBs with greater than 40-hour retention). Discharge Monitoring continues COG502235 discharge monitoring compliance.

4. Reclamation Phase

4.1. Restoration Hydrology

Complete Restoration includes native vegetation establishment returning to shortgrass prairie ecosystem, natural infiltration with restored soil conditions supporting natural water cycle, and drainage pattern restoration returning to pre-development flow patterns.

Hydrologic Performance features runoff coefficients returning to pre-development values (0.30-0.35), peak flow rates matching pre-development conditions exactly, and long-term stability with zero net increase in impervious area achieved.

5. Regulatory Compliance Analysis

5.1. 4.7.1 Adams County Requirements

Detention Compliance includes Mining Phase enhanced stormwater control per Chapter 9 requirements, complete containment with stormwater control berms containing all storm events, Reclamation Phase demonstration of return to pre-development conditions, and WQCV Treatment provided through three temporary EDBs per MHFD EDB design sheets.

5.2. State Compliance

DRMS Integration includes Mining Permit #M1983060 providing existing state mining permit compliance, Reclamation Bond providing financial assurance for restoration within 180 days, and Final Restoration returning to agricultural/open space use.

CDPHE Coordination includes COG502235 continuing existing discharge monitoring compliance and Water Quality Standards with treatment measures designed to meet state requirements.

Detailed UD-Rational Method calculations are provided in the attachments showing all three phases and sensitivity analysis

6. Hydraulic Analysis

6.1. Stormwater Management System Overview

To manage runoff generated during the mining phase and minimize offsite sediment discharge, the hydraulic infrastructure includes three Extended Detention Basins (EDBs) for water quality treatment, stormwater control berms around mining areas for complete storm containment, natural swales for conveyance, and pumped discharge system from EDBs to approved CDPS discharge point.

6.2. Extended Detention Basins (EDBs)

Three EDBs are proposed for Basins 1, 2, and 3, designed specifically to capture the Water Quality Capture Volume (WQCV) with greater than 40-hour retention time.

Key Design Features include temporary construction with all EDBs backfilled and reclaimed upon cessation of operations, side slopes of 2H:1V (2 horizontal to 1 vertical) for temporary construction, no spillways since EDBs are actively pumped out and do not contain the 100-year event, active pumping with all EDBs and their respective mining pods pumped of stormwater after 40 hours of detention, and discharge point with all pumping to the approved CDPS discharge point.

The design rationale for side slopes recognizes that while Adams County typically requires 4H:1V side slopes for permanent EDBs, the proposed 2H:1V slopes are appropriate for these temporary facilities because of their temporary nature with complete backfilling and reclamation

within 180 days of operations cessation, active management with daily personnel oversight ensuring slope stability and maintenance, construction efficiency with steeper slopes reducing footprint and excavation requirements, and reclamation integration with temporary slopes facilitating efficient backfilling during reclamation.

6.2.1. EDB Sizing and WQCV Requirements

EDB sizing is shown on the attached MHFD EDB design sheets provided in the attachments. These calculations detail Water Quality Capture Volume (WQCV) calculations for each basin, stage-storage relationships for temporary basins with 2H:1V slopes, and detention volume requirements for each EDB.

6.3. Stormwater Control Berms

Stormwater control berms will be constructed around the disturbed areas in each mining pod to provide complete containment of all storm events.

Design Features include minimum height of 2 feet tall minimum, side slopes of 2H:1V (2 horizontal to 1 vertical), complete containment of minor and major storm events within mining areas, construction material of onsite materials, flow direction directing collected runoff to EDBs for treatment, and access maintained for equipment and inspection.

Storm Event Containment includes Minor Storms (2-, 5-, 10-year) completely contained within stormwater control berms, Major Storm (100-year) completely contained within stormwater control berms, and No External Discharge during storm events from mining areas.

6.4. Conveyance System

Natural swales and channels preserve existing drainage patterns where possible, enhance with erosion control measures as needed, and direct flows from stormwater control berms to EDBs for treatment.

The internal collection system directs flows from stormwater control berms to EDBs, minimizes external discharge during storm events, and uses temporary systems designed for reclamation removal.

6.5. Hydraulic Capacity Verification

Design Storm Capacity includes all storm events contained within stormwater control berms, no external discharge during storm events from mining areas, and controlled release through post-storm pumping from EDBs to approved CDPS discharge point only.

Complete Containment Strategy includes stormwater control berms sized to contain 100-year storm event with freeboard and water quality treatment with all collected runoff treated in EDBs before controlled discharge.

6.6. Water Quality Treatment Performance

The EDB system is designed to meet Adams County and CDPHE requirements for sediment removal through settling in temporary basins with 2H:1V slopes, greater than 40-hour retention time for water quality improvement, controlled discharge through pumping system to approved CDPS discharge point, and complete reclamation with EDB backfilling upon operations cessation.

Treatment Mechanisms include sedimentation in temporary EDBs, extended storage allowing particulate settling, pumped discharge after 40-hour minimum retention, and all discharge directed to approved CDPS discharge point.

7. Detention Requirements

7.1. Regulatory Requirements

Adams County requires onsite detention for all development projects per Chapter 9, Section 9-01-11. The Thornburg Pit mining operation presents unique circumstances that differ from typical development projects. Key Requirements include storage of 5-year and 100-year runoff volumes, water quality capture volume (WQCV) treatment, post-development flows cannot exceed pre-development flows, and maximum release rates per Table 9.16 of Adams County criteria. The Thornburg Pit employs a complete containment approach during the mining phase through the combination of EDBs and stormwater control berms.

7.2. Water Quality Treatment (EDBs)

Extended Detention Basins provide WQCV treatment only through temporary construction with 2H:1V side slopes. No spillways exist since EDBs are actively pumped out and do not contain the 100-year event. Active management by mine personnel includes 40-hour minimum detention with all EDBs and their respective mining pods pumped of stormwater after 40 hours of detention. Approved discharge point directs all pumping to the approved CDPS discharge point. Complete backfilling occurs upon operations cessation.

7.3. Complete Storm Containment (Stormwater Control Berms)

Minimum 2-foot tall berms with 2H:1V side slopes around mining pods provide complete containment of all storm events (minor and major) within mining areas. No external discharge occurs during storm events with controlled post-storm pumping for water quality treatment.

7.4. Detention Volume Calculations

The design provides onsite detention through the combination of the EDBs and the stormwater control berms. 100-year and 5-year storm volumes are calculated in the EDB design sheets provided in the attachments. WQCV Requirements include total WQCV calculations provided in the MHFD EDB design sheets and all WQCV treated through three temporary EDBs with

greater than 40-hour retention. Table 2 summarizes the detention volume onsite, both required and provided.

Table 2. - Detention Volume Summary

Basin	5-Year Storage (ac-ft)	100-Year Storage (ac-ft)	WQCV Storage (ac-ft)
Required			
1	1.226	3.708	0.506
2	0.024	0.868	0.058
3	0.014	0.559	0.034
Provided			
Basin	5-Year Storage (ac-ft)	100-Year Storage (ac-ft)	WQCV Storage (ac-ft)
1	3.98	3.98	0.576
2	3.58	3.58	0.149
3	6.65	6.65	0.047

7.5. Complete Containment System

Mining Phase Discharge Method includes no discharge during storm events with complete containment within stormwater control berms, post-storm pumping with controlled discharge from EDBs after greater than 40-hour retention to approved CDPS discharge point, rate control with pumping maintaining rates below allowable limits, and water quality treatment with all discharge treated through EDB system.

Reclamation Phase includes infrastructure removal with all temporary EDBs backfilled and stormwater control berms removed, natural restoration returning to pre-development hydrology, and zero impact with natural infiltration and evaporation patterns restored.

7.6. Three-Phase Detention Analysis

Given the nature of mining operations, detention analysis addresses three distinct phases.

Phase 1: Pre-Development includes natural drainage patterns, prairie vegetation and natural infiltration, and baseline flow conditions.

Phase 2: Mining includes complete storm containment within stormwater control berms (minimum 2-ft tall, 2H:1V slopes), temporary EDBs providing water quality treatment (2H:1V slopes, no spillways), no external discharge during storm events, controlled post-storm pumping to approved CDPS discharge point after 40-hour minimum retention, and active management during operations.

Phase 3: Reclamation includes complete infrastructure removal with EDBs backfilled and stormwater control berms removed, site restoration with native vegetation, return to pre-development hydrology, zero percent increase in impervious area, and natural infiltration and drainage patterns restored.

This approach ensures compliance with Adams County requirements while providing enhanced protection through complete storm containment during active mining operations.

8. Downstream Impact/Outfall Analysis

Per Adams County requirements, a comprehensive analysis of downstream impacts has been conducted to ensure the proposed development does not adversely affect downstream properties or infrastructure.

All controlled post-storm discharge occurs through approved CDPS discharge point. No discharge occurs during storm events due to complete containment within stormwater control berms. Controlled post-storm discharge occurs after greater than 40-hour retention in EDBs with ultimate discharge to Kiowa Creek via approved discharge point.

The receiving water hierarchy includes immediate approved CDPS discharge point (post-storm controlled discharge only), primary Kiowa Creek (along western/northwestern property boundary), and ultimate South Platte River via Kiowa Creek.

8.1. Impact Analysis Results

Table 3. Three-Phase Flow Comparison

Phase	Condition	2-Year (cfs)	5-Year (cfs)	10-Year (cfs)	100-Year (cfs)
1	Pre-Development	26.28	36.55	47.16	134.06
2	Mining (uncontrolled)	45.74	64.51	81.74	197.30
2	Mining (with complete containment)	0.0*	0.0*	0.0*	0.0*
2	Mining (post-storm controlled discharge)	≤26.28	≤36.55	≤47.16	≤134.06
3	Reclamation	26.28	36.55	47.16	134.06

*No discharge during storm events due to complete containment within stormwater control berms

With complete storm containment and controlled post-storm pumping to the approved CDPS discharge point, there will be no discharge during storm events. Post-storm controlled discharge will be maintained at or below pre-development levels. Reclamation phase returns to natural pre-development conditions, ensuring no long-term adverse downstream impacts.

8.2. Water Quality Impact Assessment

Mining Phase Protection includes complete storm containment with no untreated runoff discharge during storm events, enhanced treatment with all discharge treated through EDBs with greater than 40-hour retention, controlled release with post-storm pumping to approved CDPS discharge point allowing optimal water quality management, and COG502235 Compliance with discharge monitoring ensuring continued compliance.

Reclamation Phase Benefits include return to natural vegetation providing enhanced filtration, restored natural infiltration reducing overall discharge volumes, and native prairie ecosystem providing long-term water quality benefits.

8.3. Flood Impact Analysis

For flood impact analysis, refer to the Floodplain Use Permit submitted separately with this application.

8.4. Regional Drainage Considerations

The project represents small percentage of overall Kiowa Creek watershed. Improved Storm Management through complete containment provides enhanced downstream protection during storm events. Controlled Discharge through post-storm release to approved CDPS discharge point maintains water quality standards.

8.5. Monitoring and Maintenance Commitments

During Mining Operations, enhanced protection through complete storm containment eliminates storm discharge impacts. Monitoring of controlled discharge water quality per COG502235 requirements to approved CDPS discharge point continues. Verification of stormwater control berm integrity and capacity occurs regularly.

Post-Reclamation includes return to natural drainage patterns eliminating artificial infrastructure, final site conditions matching pre-development characteristics, and natural ecosystem providing enhanced long-term water quality protection.

Soils & Geotechnical Conditions

1. Soil Survey Information

Soil Survey Data includes primary soil type of sandy loam, Hydrologic Soil Group A (high infiltration capacity), drainage class of well-drained to somewhat excessively drained, and typical depth to restrictive layer greater than 60 inches. The NRCS soil map and associated survey are attached.

Engineering Properties include infiltration rate of moderate to high (consistent with HSG A classification), permeability generally suitable for natural drainage, erosion potential of moderate when disturbed, and stability generally stable for proposed mining operations.

Implications for Drainage Design include sandy loam soils supporting natural infiltration, appropriateness for temporary Extended Detention Basin construction, potential requirement for erosion control during disturbance, and suitability for final reclamation with native vegetation.

2. Geotechnical Assessment

Mining Operation Considerations include drainage conditions during mining managed with temporary EDBs and stormwater control berms, COG502235 discharge permit requirements governing operations, all infrastructure being temporary with complete backfilling and removal planned, final reclamation returning site to pre-development condition, and zero percent increase in impervious area upon completion.

Based on the temporary nature of mining operations and planned restoration to pre-development conditions, a detailed geotechnical stability report is not required for this drainage study. The supporting factors include temporary operations with mining being temporary with full reclamation planned within 180 days, regulatory oversight with DRMS and CDPHE permits providing operational oversight, final conditions with site restoration to natural conditions, no permanent structures with no permanent buildings or infrastructure proposed, and complete infrastructure removal with all EDBs and berms removed and backfilled.

Erosion and Sediment Control Measures

Erosion and sediment control measures for the Thornburg Pit will comply with Adams County Chapter 9 Construction Stormwater Management requirements, Colorado Department of Public Health and Environment (CDPHE) Construction General Permit, Division of Reclamation, Mining & Safety (DRMS) requirements, and Best Management Practices per MHFD Urban Storm Drainage Criteria Manual, Volume 3.

1. Mining Phase Control Measures

Primary Erosion Control Strategies include complete storm containment directing all runoff to stormwater control berms for containment, minimizing exposed area by limiting disturbance to active mining areas only, and slope protection using erosion control blankets on temporary slopes.

Complete Containment Approach includes stormwater control berms providing primary sediment containment around each mining pod, no external discharge during storm events from mining areas, Extended Detention Basins providing secondary treatment for collected runoff with greater than 40-hour retention, and controlled release through post-storm pumping to approved CDPS discharge point.

Vehicle Tracking Control includes stabilized construction entrances.

Materials Management includes stockpile management covering or seeding stockpiles greater than 30 days, spill prevention through proper storage and handling of fuels, oils, and chemicals, good housekeeping with regular cleanup and maintenance of work areas, vehicle maintenance in designated areas with spill containment, and concrete washout in designated washout areas within containment system.

1.1. Complete Containment System

Primary Containment Strategy includes minimum 2-foot height with 2H:1V side slopes around each mining pod, complete storm containment with all storm events contained within berms, volume sizing designed to contain 100-year storm event with freeboard, and flow direction directing collected runoff to temporary EDBs for treatment.

Enhanced Water Quality Treatment includes WQCV Treatment with greater than 40-hour retention for particle settling, temporary construction with 2H:1V side slopes with active management, sediment management through regular removal when 20% of storage lost, and complete removal through backfilling upon operations cessation.

2. Reclamation Phase Control Measures

Complete Infrastructure Removal includes EDB backfilling with all temporary basins completely backfilled, berm removal with all stormwater control berms removed, site regrading returning to natural contours, and decompaction restoring natural infiltration in backfilled areas.

Vegetation Establishment includes seed mix of native shortgrass prairie species per DRMS-approved seed list, application rate, timing with fall seeding preferred for native grass establishment, and success criteria of 70% cover density compared to original undisturbed site.

Soil Preparation includes topsoil replacement with 6-inch minimum depth from stockpiled material, subgrade preparation ripping compacted areas to enhance root penetration, organic amendment with compost or other organic matter if needed, and pH adjustment with lime application if soil testing indicates need.

Permanent Stabilization includes natural slope restoration returning to original topographic contours, native vegetation providing long-term erosion protection, natural drainage restoring pre-mining drainage patterns, and no artificial structures with complete removal of all temporary infrastructure.

Conclusions and Recommendations

This Level III Drainage Study demonstrates that the Bennett Creek Ranch Gravel Pit Conditional Use Permit renewal can be granted with full compliance to Adams County Chapter 9 Storm Drainage Design and Technical Criteria. The comprehensive analysis addresses the three phases of Pre-Development, Mining, and Reclamation conditions while ensuring protection of water quality and downstream properties throughout the operational period and final restoration.

References

1. Adams County Development Standards and Regulations, Chapter 9 - Storm Drainage Design and Stormwater Quality Regulations, December 8, 2020.
2. Mile High Flood District (MHFD), Urban Storm Drainage Criteria Manual, Volumes 1, 2, and 3, as amended.
3. UD-Rational Method Workbook, Version 2.0, Urban Drainage and Flood Control District.
4. Colorado Department of Public Health and Environment (CDPHE), COG502235 Discharge Permit Requirements.
5. National Resource Conservation Service (NRCS), Web Soil Survey, Adams County, Colorado.
6. National Oceanic and Atmospheric Administration (NOAA), "Precipitation-Frequency Atlas of the Western United States," Atlas 14, Volume 1.
7. Colorado Division of Reclamation, Mining and Safety (DRMS), Rules and Regulations for Coal Mining, 2 CCR 407-2.
8. Colorado Department of Transportation (CDOT), Standard Specifications and Item Code Book, as amended.
9. MHFD Rational Method Worksheets (attached)
10. MHFD EDB Design Sheets (attached)
11. Bennett Creek Ranch LLC Conditional Use Permit Application materials

Attachments

MHFD Rational Calculations

Drainage Basin Maps

MHFD EDB Calculations

NRCS Soils Report

NOAA PFDS Report

PEAK RUNOFF PREDICTION BY THE RATIONAL METHOD

Version 2.00 released May 2017
Urban Drainage and Flood Control District
Denver, Colorado

Purpose:

This workbook applies the Rational Method to estimate stormwater runoff and peak flows from small urban catchments (typically less than 90 acres)

Function:

1. **To calculate the runoff coefficient, C for a catchment**
2. **To calculate the time of concentration, and then compare with the regional time of concentration limit used for the Denver region. The smaller one is recommended as the rainfall duration for use with the Rational Method.**
3. **To calculate the design rainfall intensity and resulting peak flow rate.**

Content:

The workbook consists of the following five sheets:

Intro	Describes the purpose of each sheet in the workbook.
Rational Calcs	Performs Rational Method calculations, Q = CIA
Weighted C	Supporting tool to calculate area-weighted runoff coefficients from sub-areas.
Weighted Slope	Supporting tool to calculate length-weighted slope from multiple flow reaches.
Weighted Tc	Supporting tool to calculate reach-weighted time of concentration from multiple flow reaches.
Design Info	Provides background information from the USDCM

Acknowledgements:

Spreadsheet Development Team:
Derek N. Rapp, P.E.
Peak Stormwater Engineering, LLC
Holly Piza, P.E. and Ken MacKenzie, P.E.
Urban Drainage and Flood Control District

Comments? Direct all comments regarding this spreadsheet workbook to: UDFCD email
Revisions? Check for revised versions of this or any other workbook at: Downloads

Calculation of Peak Runoff using Rational Method

Designer: Christina Hutchins
Company:
Date: 8/27/2025
Project: Bennett Creek Ranch
Location: Thornburg Pit

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$t_t = \frac{L_t}{60K_v\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Computed}t_c = t_i + t_t$$

$$\text{Regional}t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

$t_{minimum} = 5$ (urban)
$t_{minimum} = 10$ (non-urban)

$$\text{Selected}t_c = \max\{t_{minimum}, \min(\text{Computed}t_c, \text{Regional}t_c)\}$$

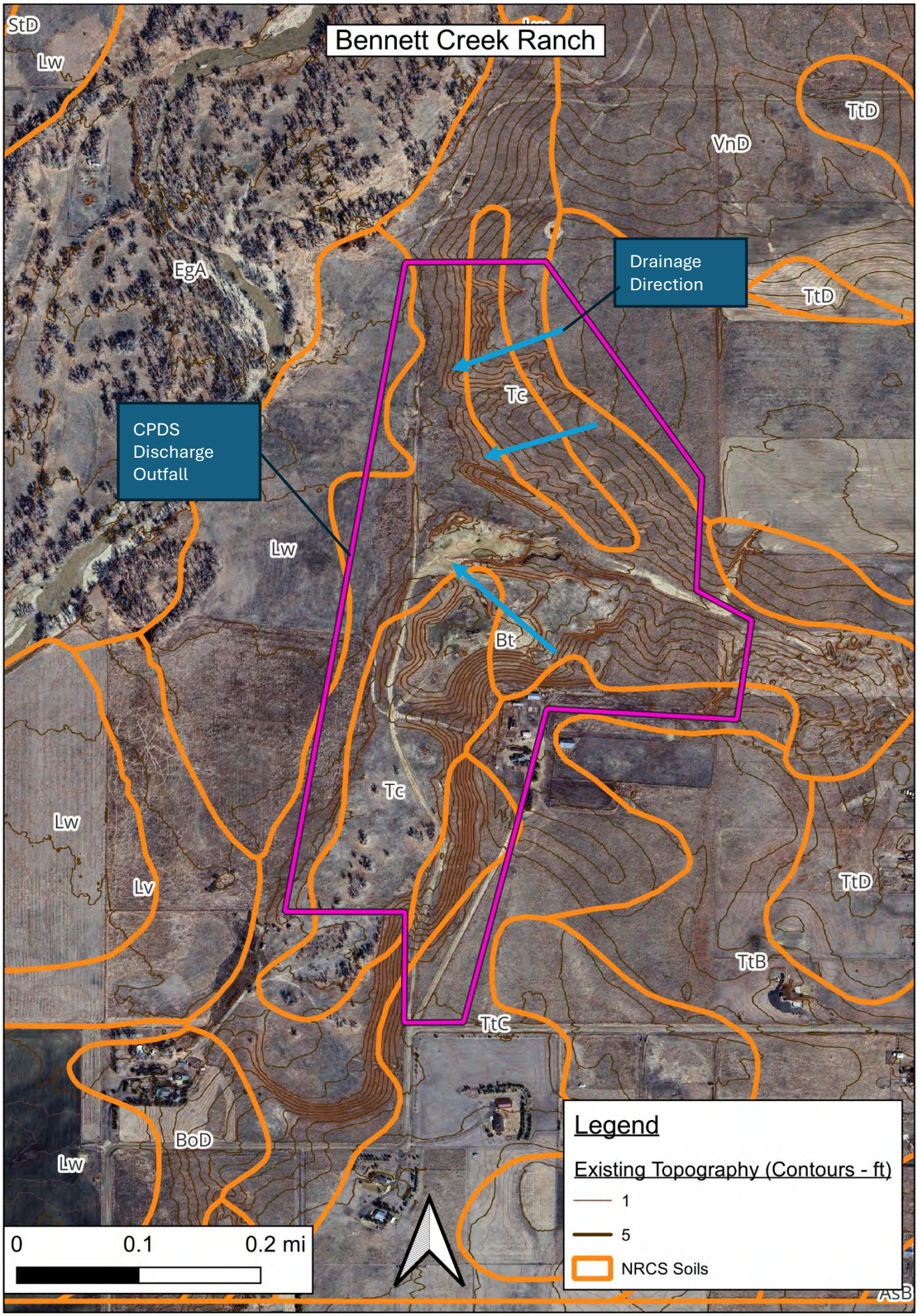
Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	0.87	1.16	1.43	1.85	2.21	2.60	3.03
Rainfall Intensity Equation Coefficients = a	28.50	10.00	0.786				
b							
c							

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time						Time of Concentration			Rainfall Intensity, I (in/hr)							Peak Flow, Q (cfs)						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Pre Basin 1	27.63	A	54.8	0.38	0.40	0.42	0.45	0.49	0.54	0.61	0.00			0.063	0.00	1232.32			0.063	2.5	0.63	32.73	32.73	21.59	10.00	2.36	3.14	3.87	5.01	5.98	7.03	8.20	25.00	34.67	44.49	62.20	81.46	104.37	137.60
Pre Basin 2	16.47	A	5.9	0.02	0.02	0.03	0.04	0.08	0.16	0.29	0.00			0.050	0.00	1180.00			0.050	2.5	0.56	35.18	35.18	33.95	10.00	2.36	3.14	3.87	5.01	5.98	7.03	8.20	0.82	1.20	1.70	3.03	7.42	18.07	39.43
Pre Basin 3	10.97	A	5.2	0.02	0.02	0.02	0.03	0.07	0.15	0.29	0.00			0.067	0.00	881.00			0.067	2.5	0.65	22.69	22.69	30.95	10.00	2.36	3.14	3.87	5.01	5.98	7.03	8.20	0.46	0.68	0.97	1.75	4.55	11.62	25.87
Post Basin 1	27.63	A	55.1	0.386597	0.402451	0.418903	0.452383	0.495554	0.539229	0.609395	0.00			0.063	0.00	1232.32			0.063	2.5	0.63	32.7312066	32.73	21.53	10.00	2.36	3.14	3.87	5.01	5.98	7.03	8.20	25.17	34.89	44.77	62.55	81.86	104.79	138.01
Post Basin 2	16.47	A	45.0	0.297004	0.310815	0.326416	0.360299	0.4093	0.46055	0.54425	0.00			0.050	0.00	1180.00			0.050	2.5	0.56	35.18080285	35.18	24.10	10.00	2.36	3.14	3.87	5.01	5.98	7.03	8.20	11.53	16.06	20.80	29.70	40.30	53.35	73.48
Post Basin 3	10.97	A	51.0	0.349571	0.364639	0.380838	0.414726	0.46054	0.50729	0.58295	0.00			0.067	0.00	881.00			0.067	2.5	0.65	22.6906625	22.69	20.84	10.00	2.36	3.14	3.87	5.01	5.98	7.03	8.20	9.04	12.56	16.17	22.78	30.22	39.16	52.44


Bennett Creek Ranch
StD
Lw
TtD
VnD
EgA
Drainage Direction
TtD
Tc
CPDS Discharge Outfall
Lw
Bt
Tc
Lw
Lv
TtD
TtB
TtC
BoD
Lw
AsB
0
0.1
0.2 mi
Legend
Existing Topography (Contours - ft)
1
5
NRCS Soils

LEGEND

BOUNDARIES

- DRMS Permit Boundary
- 200 ft Offset of DRMS Permit Boundary

BUILDINGS AND RELATED STRUCTURES

- Buildings
- Fence

LAND SURVEYS

- Section line
- Property Boundary
- Mining Claim

ROADS AND RELATED FEATURES

- Light duty road, gravel

RIVERS, LAKES, SHORELINES, AND CANALS

- Perennial Stream/Ditch
- Intermittent Stream/Ditch
- Drainage Basin Limits
- Drainage Direction
- 100-Yr Floodplain

CONTOURS

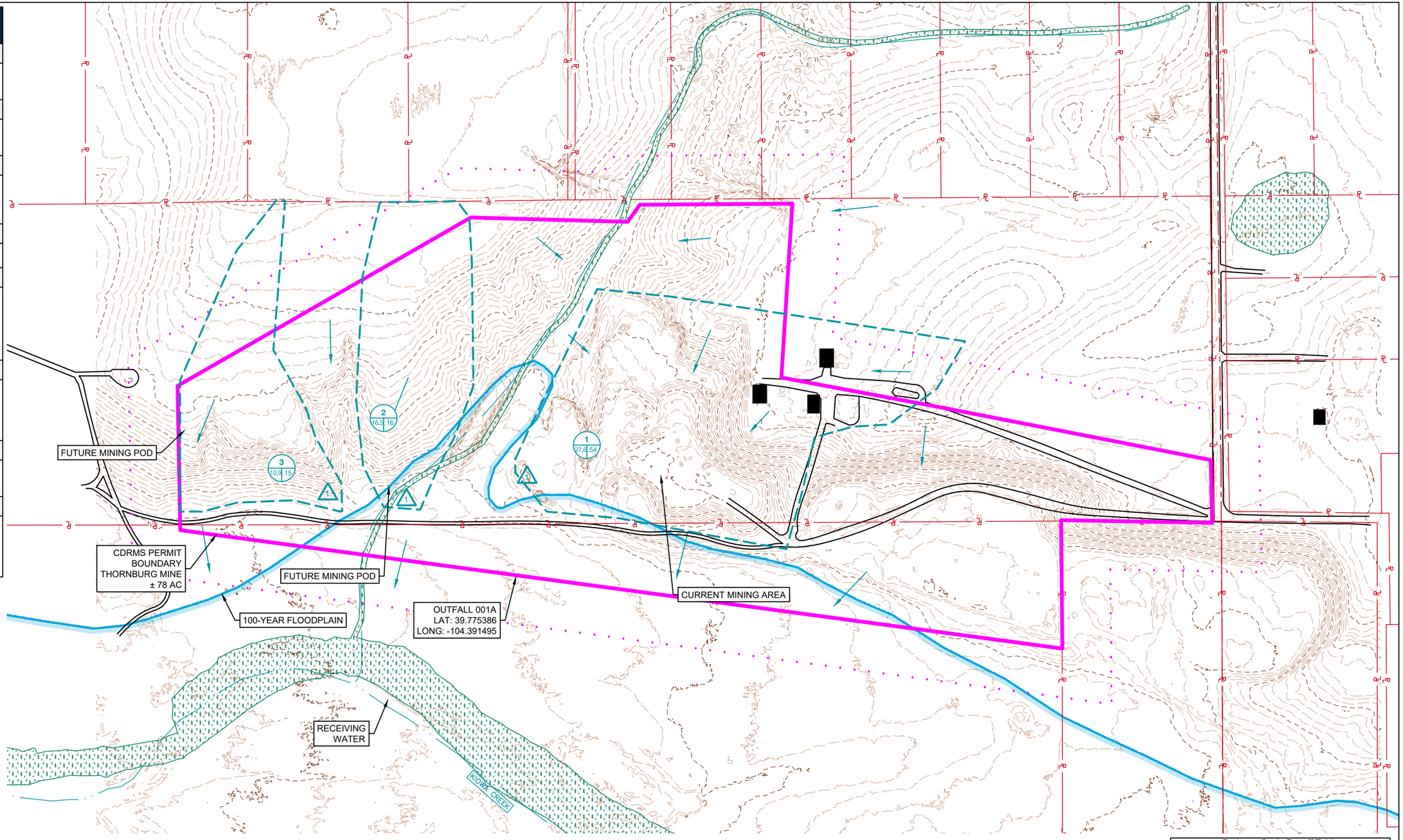
- Existing Major Contour — 5280'
- Existing Minor Contour — 5281'
- Post-Mining Major Contour — 5280'
- Post-Mining Minor Contour — 5281'

VEGETATION

- National Wetlands Inventory

DRAINAGE DATA

Basin (Area (acres) / Runoff Coefficient) — Basin Destination



Historic Drainage Map

Thornburg Pit

DRMS Permit Number: M1983060 — Bennett Creek Ranch LLC

Mine Entry Location: Latitude: ---- Longitude: ----
State: CO County: Adams Nearest Town: Bennett
Section: 24 Township: 3S Range: 63W PM: 6th
Major Watershed: Kiowa Creek
Map Scale: 1" = 200'

0 200' 400'

Map Georeferencing Information: Datum: NAD83 Projection: CO CENTRAL

Survey Source: CO LIDAR
Imagery Source: Google
Survey Date: 2013
Imagery Date: 2024

Drawn by: LLD Date: 8/28/2025
Checked by: BEL Date: 11/24/24
Approved by: BEL Date: 11/24/24

File Name: Thornburg Pit

.\IMAGES\Basic Logo.png

3375 West Powers Circle Littleton, CO USA 80123 (303)-346-5196 info@lewicki.biz

Drainage Basin Runoff Table

Sites	Area (acres)	Pre-Developed Runoff Coefficient. (C)	Post-Developed Runoff Coefficient. (C)
Basin 1	27.63	0.54	0.54
Basin 2	16.47	0.16	0.46
Basin 3	10.97	0.15	0.51

LEGEND

BOUNDARIES

- DRMS Permit Boundary
- 200 ft Offset of DRMS Permit Boundary

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- Buildings
- Fence

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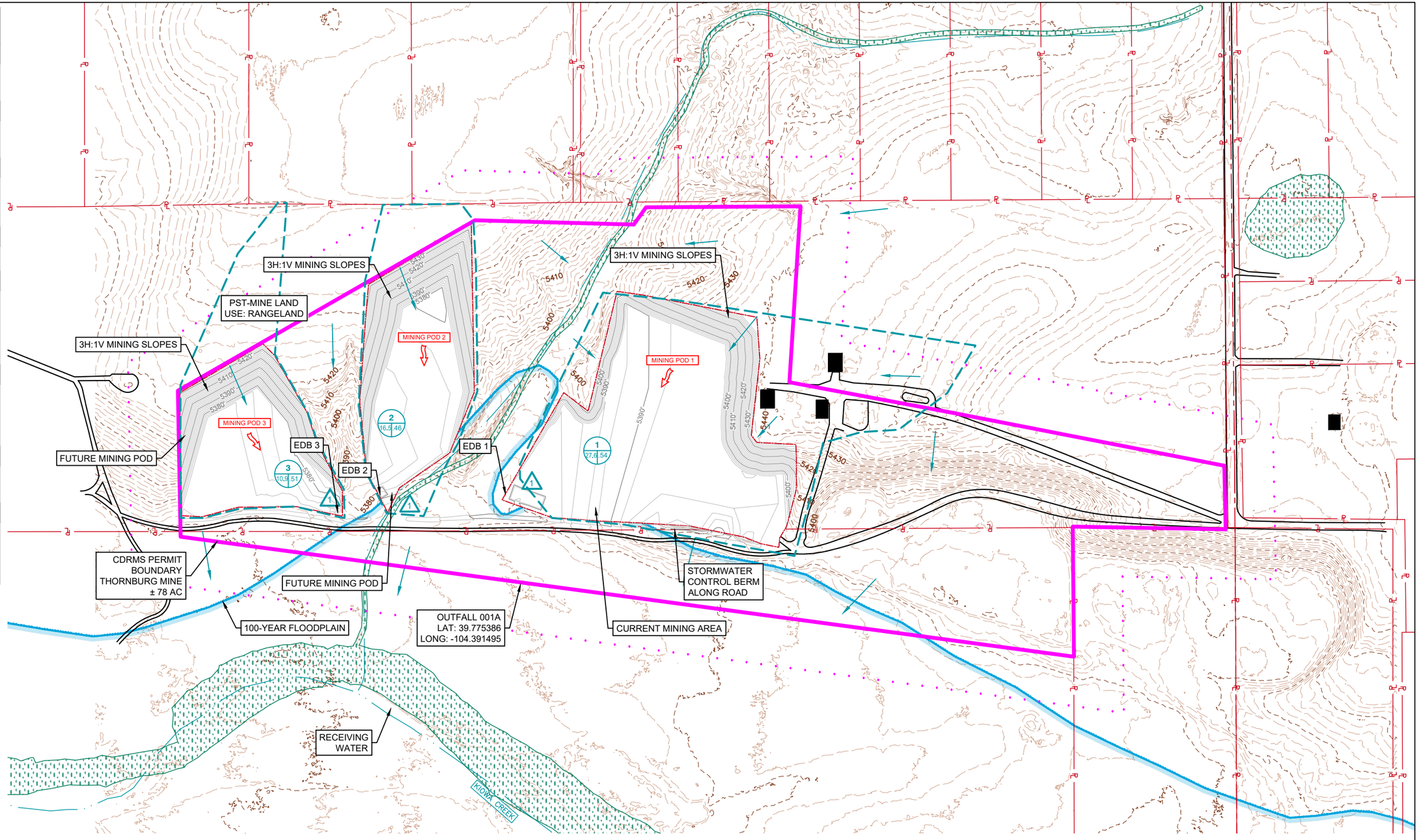
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- National Wetlands Inventory

DRAINAGE DATA

Basin — Area (acres) — Runoff Coefficient; Basin Destination



Proposed Drainage Map

Thornburg Pit

DRMS Permit Number: M1983060 — Bennett Creek Ranch LLC

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Section: 24 Township: 3S Range: 63W PM: 6th
Major Watershed: Kiowa Creek

Map Scale: 1" = 200'

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Basin 1	27.63	0.54	0.54
Basin 2	16.47	0.16	0.46
Basin 3	10.97	0.15	0.51

MILE HIGH FLOOD DISTRICT

DETENTION BASIN DESIGN WORKBOOK

MHFD-Detention, Version 4.07 (June 2025)
Mile High Flood District
Denver, Colorado
www.mhfd.org

Purpose:

This workbook aids in the estimation of stormwater detention basin sizing and outlet routing based on the modified puls routing method for urban watersheds. Several different SCM types and various outlet configurations can be sized.

Function:

1. Approximates the stage-area-volume relationship for a detention basin based on watershed parameters and basin geometry parameters. Also evaluates existing user-defined basin stage-area relationships.

2. Sizes filtration media orifice, outlet orifices, elliptical slots, weirs, trash racks, and develops stage-discharge relationships. Uses the Modified Puls method to route a series of hydrographs (i.e., 2-, 5-, 10-, 25-, 50-, 100- and 500-year) and calibrates the peak discharge out of the basin to match the pre-development peak discharges for the watershed.

Content: **This workbook consists of the following sheets:**

Basin	Tabulates stage-area-volume relationship estimates based on watershed parameters
Outlet Structure	Tabulates a stage-discharge relationship for the user-defined outlet structure (inlet control).
Reference	Provides reference equations and figures.
User Tips and Tools	Provides instructions and video links to assist in using this workbook. Includes a stage-area calculator.
SCM Zone Images	Provides images of typical SCM zone confirgurations corresponding with Zone pulldown selections.

Acknowledgements: ***Spreadsheet Development Team:***
Ken MacKenzie, P.E., Holly Piza, P.E.
Mile High Flood District

Derek N. Rapp, P.E.
Peak Stormwater Engineering, LLC

Dr. James C.Y. Guo, Ph.D., P.E.
Professor, Department of Civil Engineering, University of Colorado at Denver

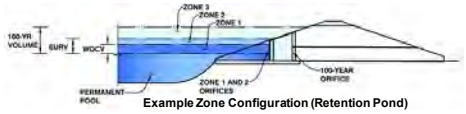
Comments? Direct all comments regarding this spreadsheet workbook to: **MHFD E-Mail**
Revisions? Check for revised versions of this or any other workbook at: **Downloads**

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Bennett Creek Ranch

Basin ID: Basin 1 EDB



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	**EDB**		**Note: L / W Ratio < 1**
Watershed Area =	27.63	acres	**L / W Ratio = 0.74**
Watershed Length =	942	ft	
Watershed Length to Centroid =	536	ft	
Watershed Slope =	0.063	ft/ft	**Steep Slope > 0.06 ft/ft**
Watershed Imperviousness =	54.80%	percent	
Percentage Hydrologic Soil Group A =	100.0%	percent	
Percentage Hydrologic Soil Group B =	0.0%	percent	
Percentage Hydrologic Soil Groups C/D =	0.0%	percent	
Target WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.506	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.791	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.87 in.) =	0.895	acre-feet	0.87	inches
5-yr Runoff Volume (P1 = 1.16 in.) =	1.226	acre-feet	1.16	inches
10-yr Runoff Volume (P1 = 1.43 in.) =	1.578	acre-feet	1.43	inches
25-yr Runoff Volume (P1 = 1.85 in.) =	2.212	acre-feet	1.85	inches
50-yr Runoff Volume (P1 = 2.21 in.) =	2.883	acre-feet	2.21	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	3.708	acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3.03 in.) =	4.593	acre-feet	3.03	inches
Approximate 2-yr Detention Volume =	0.846	acre-feet		
Approximate 5-yr Detention Volume =	1.175	acre-feet		
Approximate 10-yr Detention Volume =	1.508	acre-feet		
Approximate 25-yr Detention Volume =	2.076	acre-feet		
Approximate 50-yr Detention Volume =	2.449	acre-feet		
Approximate 100-yr Detention Volume =	2.868	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.506	acre-feet	
Select Zone 2 Storage Volume (Optional) =		acre-feet	**Total detention volume is**
Select Zone 3 Storage Volume (Optional) =		acre-feet	**less than 100-year**
Total Detention Basin Volume =	0.506	acre-feet	**volume.**
Initial Surcharge Volume (ISV) =	66	ft^3	
Initial Surcharge Depth (ISD) =	0.33	ft	
Total Available Detention Depth (H_{total}) =	3.50	ft	
Depth of Trickle Channel (H_{TC}) =	0.10	ft	
Slope of Trickle Channel (S_{TC}) =	0.002	ft/ft	
Slopes of Main Basin Sides (S_{main}) =	2	H:V	**Smain not typical.**
Basin Length-to-Width Ratio ($R_{L/W}$) =	3		

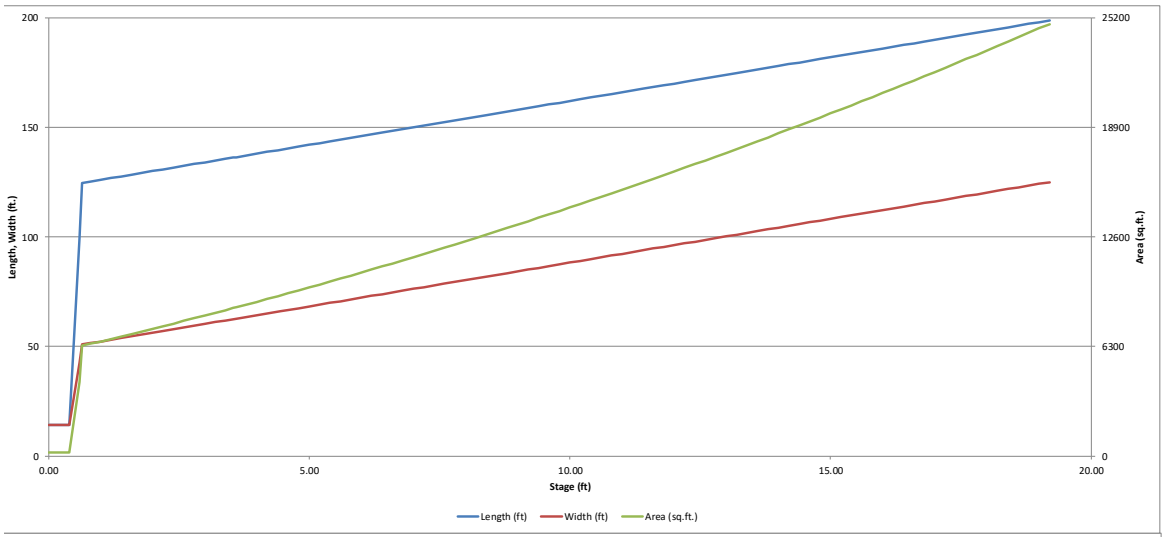
Initial Surcharge Area (A_{ISV}) =	200	ft^2
Surcharge Volume Length (L_{ISV}) =	14.2	ft
Surcharge Volume Width (W_{ISV}) =	14.2	ft
Depth of Basin Floor (H_{FLOOR}) =	0.22	ft
Length of Basin Floor (L_{FLOOR}) =	124.6	ft
Width of Basin Floor (W_{FLOOR}) =	50.8	ft
Area of Basin Floor (A_{FLOOR}) =	6,333	ft^2
Volume of Basin Floor (V_{FLOOR}) =	562	ft^3
Depth of Main Basin (H_{MAIN}) =	2.85	ft
Length of Main Basin (L_{MAIN}) =	136.0	ft
Width of Main Basin (W_{MAIN}) =	62.2	ft
Area of Main Basin (A_{MAIN}) =	8,462	ft^2
Volume of Main Basin (V_{MAIN}) =	21,010	ft^3
Calculated Total Basin Volume (V_{total}) =	**0.497**	acre-feet

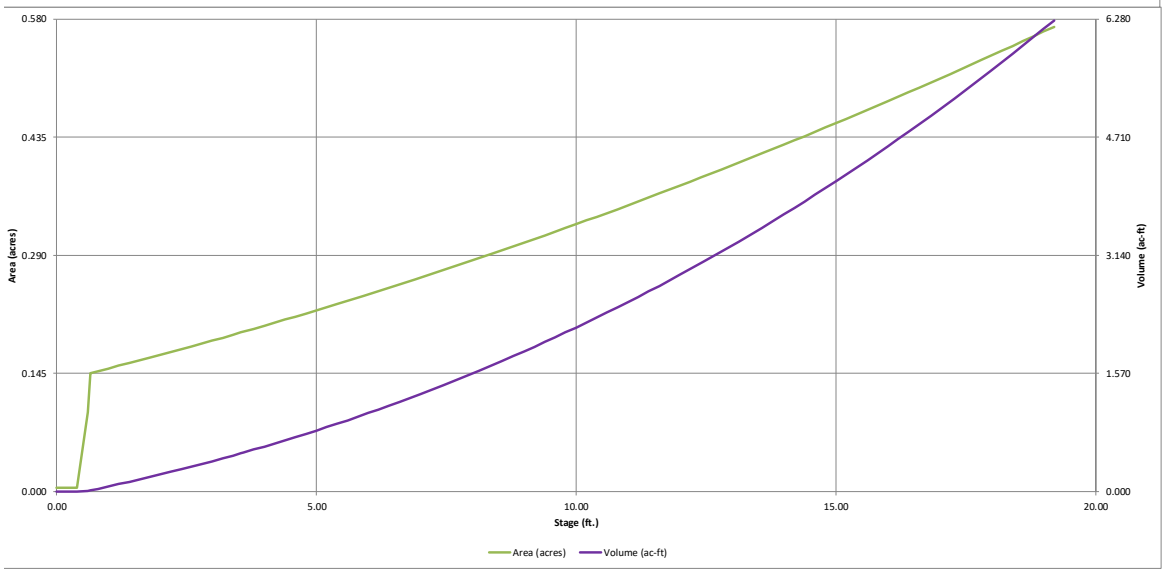
Depth Increment = 0.20 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		14.2	14.2	200		0.005		
ISV	0.33		14.2	14.2	200		0.005	66	0.002
	0.40		14.2	14.2	200		0.005	80	0.002
	0.60		99.5	42.5	4,228		0.097	394	0.009
Floor	0.65		124.6	50.8	6,333		0.145	656	0.015
	0.80		125.2	51.4	6,438		0.148	1,614	0.037
	1.00		126.0	52.2	6,580		0.151	2,916	0.067
	1.20		126.8	53.0	6,723		0.154	4,246	0.097
	1.40		127.6	53.8	6,868		0.158	5,605	0.129
	1.60		128.4	54.6	7,014		0.161	6,994	0.161
	1.80		129.2	55.4	7,161		0.164	8,411	0.193
	2.00		130.0	56.2	7,309		0.168	9,858	0.226
	2.20		130.8	57.0	7,459		0.171	11,335	0.260
	2.40		131.6	57.8	7,610		0.175	12,841	0.295
	2.60		132.4	58.6	7,762		0.178	14,379	0.330
	2.80		133.2	59.4	7,915		0.182	15,946	0.366
	3.00		134.0	60.2	8,070		0.185	17,545	0.403
	3.20		134.8	61.0	8,226		0.189	19,174	0.440
	3.40		135.6	61.8	8,383		0.192	20,835	0.478
Zone 1 (WQCV)	3.55		136.2	62.4	8,502		0.195	22,102	0.507
	3.60		136.4	62.6	8,542		0.196	22,528	0.517
	3.80		137.2	63.4	8,702		0.200	24,252	0.557
	4.00		138.0	64.2	8,863		0.203	26,008	0.597
	4.20		138.8	65.0	9,025		0.207	27,797	0.638
	4.40		139.6	65.8	9,189		0.211	29,619	0.680
	4.60		140.4	66.6	9,354		0.215	31,473	0.723
	4.80		141.2	67.4	9,520		0.219	33,360	0.766
	5.00		142.0	68.2	9,688		0.222	35,281	0.810
	5.20		142.8	69.0	9,857		0.226	37,235	0.855
	5.40		143.6	69.8	10,027		0.230	39,224	0.900
	5.60		144.4	70.6	10,198		0.234	41,246	0.947
	5.80		145.2	71.4	10,371		0.238	43,303	0.994
	6.00		146.0	72.2	10,545		0.242	45,395	1.042
	6.20		146.8	73.0	10,720		0.246	47,521	1.091
	6.40		147.6	73.8	10,896		0.250	49,683	1.141
	6.60		148.4	74.6	11,074		0.254	51,880	1.191
	6.80		149.2	75.4	11,253		0.258	54,112	1.242
	7.00		150.0	76.2	11,433		0.262	56,381	1.294
	7.20		150.8	77.0	11,615		0.267	58,686	1.347
	7.40		151.6	77.8	11,798		0.271	61,027	1.401
	7.60		152.4	78.6	11,982		0.275	63,405	1.456
	7.80		153.2	79.4	12,168		0.279	65,820	1.511
	8.00		154.0	80.2	12,354		0.284	68,272	1.567
	8.20		154.8	81.0	12,542		0.288	70,762	1.624
	8.40		155.6	81.8	12,732		0.292	73,289	1.682
	8.60		156.4	82.6	12,922		0.297	75,855	1.741
	8.80		157.2	83.4	13,114		0.301	78,458	1.801
	9.00		158.0	84.2	13,307		0.305	81,100	1.862
	9.20		158.8	85.0	13,502		0.310	83,781	1.923
	9.40		159.6	85.8	13,697		0.314	86,501	1.986
	9.60		160.4	86.6	13,894		0.319	89,260	2.049
	9.80		161.2	87.4	14,093		0.324	92,059	2.113
	10.00		162.0	88.2	14,292		0.328	94,897	2.179
	10.20		162.8	89.0	14,493		0.333	97,776	2.245
	10.40		163.6	89.8	14,695		0.337	100,695	2.312
	10.60		164.4	90.6	14,898		0.342	103,654	2.380
	10.80		165.2	91.4	15,103		0.347	106,654	2.448
	11.00		166.0	92.2	15,309		0.351	109,695	2.518
	11.20		166.8	93.0	15,516		0.356	112,778	2.589
	11.40		167.6	93.8	15,725		0.361	115,902	2.661
	11.60		168.4	94.6	15,935		0.366	119,068	2.733
	11.80		169.2	95.4	16,146		0.371	122,276	2.807
	12.00		170.0	96.2	16,358		0.376	125,526	2.882
	12.20		170.8	97.0	16,572		0.380	128,819	2.957
	12.40		171.6	97.8	16,786		0.385	132,155	3.034
	12.60		172.4	98.6	17,003		0.390	135,534	3.111
	12.80		173.2	99.4	17,220		0.395	138,956	3.190
	13.00		174.0	100.2	17,439		0.400	142,422	3.270
	13.20		174.8	101.0	17,659		0.405	145,932	3.350
	13.40		175.6	101.8	17,880		0.410	149,486	3.432
	13.60		176.4	102.6	18,103		0.416	153,084	3.514
	13.80		177.2	103.4	18,327		0.421	156,727	3.598
	14.00		178.0	104.2	18,552		0.426	160,414	3.683
	14.20		178.8	105.0	18,778		0.431	164,147	3.768
	14.40		179.6	105.8	19,006		0.436	167,926	3.855
	14.60		180.4	106.6	19,235		0.442	171,750	3.943
	14.80		181.2	107.4	19,465		0.447	175,620	4.032
	15.00		182.0	108.2	19,697		0.452	179,536	4.122
	15.20		182.8	109.0	19,929		0.458	183,499	4.213
	15.40		183.6	109.8	20,164		0.463	187,508	4.305
	15.60		184.4	110.6	20,399		0.468	191,564	4.398
	15.80		185.2	111.4	20,636		0.474	195,667	4.492
	16.00		186.0	112.2	20,873		0.479	199,818	4.587
	16.20		186.8	113.0	21,113		0.485	204,017	4.684
	16.40		187.6	113.8	21,353		0.490	208,264	4.781
	16.60		188.4	114.6	21,595		0.496	212,558	4.880
	16.80		189.2	115.4	21,838		0.501	216,902	4.979
	17.00		190.0	116.2	22,082		0.507	221,294	5.080
	17.20		190.8	117.0	22,328		0.513	225,735	5.182
	17.40		191.6	117.8	22,575		0.518	230,225	5.285
	17.60		192.4	118.6	22,823		0.524	234,765	5.389
	17.80		193.2	119.4	23,073		0.530	239,354	5.495
	18.00		194.0	120.2	23,323		0.535	243,994	5.601
	18.20		194.8	121.0	23,575		0.541	248,684	5.709
	18.40		195.6	121.8	23,829		0.547	253,424	5.818
	18.60		196.4	122.6	24,083		0.553	258,215	5.928
	18.80		197.2	123.4	24,339		0.559	263,057	6.039
	19.00		198.0	124.2	24,596		0.565	267,951	6.151
	19.20		198.8	125.0	24,855		0.571	272,896	6.265

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)



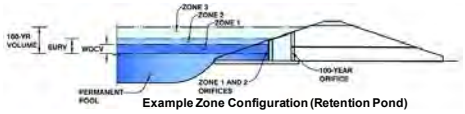


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Bennett Creek Ranch

Basin ID: Basin 2 EDB



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	**EDB**	
Watershed Area =	16.47	acres
Watershed Length =	1,159	ft
Watershed Length to Centroid =	525	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	5.90%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.058	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.062	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.87 in.) =	0.008	acre-feet	0.87	inches
5-yr Runoff Volume (P1 = 1.16 in.) =	0.024	acre-feet	1.16	inches
10-yr Runoff Volume (P1 = 1.43 in.) =	0.045	acre-feet	1.43	inches
25-yr Runoff Volume (P1 = 1.85 in.) =	0.154	acre-feet	1.85	inches
50-yr Runoff Volume (P1 = 2.21 in.) =	0.457	acre-feet	2.21	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	0.868	acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3.3 in.) =	1.675	acre-feet	3.30	inches
Approximate 2-yr Detention Volume =	0.026	acre-feet		
Approximate 5-yr Detention Volume =	0.039	acre-feet		
Approximate 10-yr Detention Volume =	0.055	acre-feet		
Approximate 25-yr Detention Volume =	0.088	acre-feet		
Approximate 50-yr Detention Volume =	0.144	acre-feet		
Approximate 100-yr Detention Volume =	0.293	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.058	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.058	acre-feet
Initial Surcharge Volume (ISV) =	8	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	4.00	ft
Depth of Trickle Channel (H_{TC}) =	1.00	ft
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft
Slopes of Main Basin Sides (S_{main}) =	3	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	

Total detention volume is less than 100-year volume.

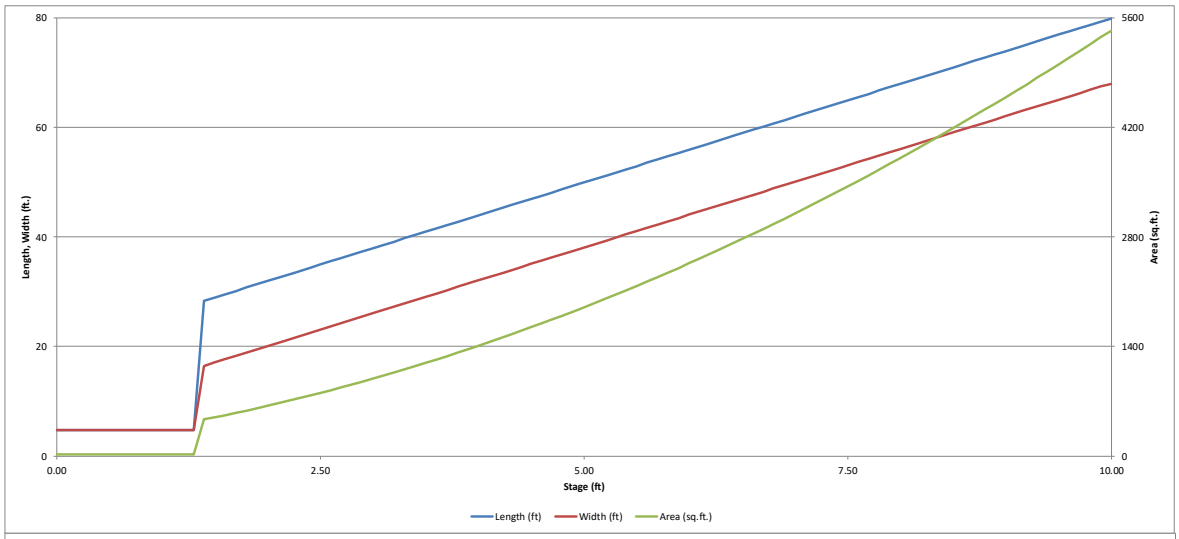
Initial Surcharge Area (A_{ISV}) =	23	ft^2
Surcharge Volume Length (L_{ISV}) =	4.8	ft
Surcharge Volume Width (W_{ISV}) =	4.8	ft
Depth of Basin Floor (H_{FLOOR}) =	0.07	ft
Length of Basin Floor (L_{FLOOR}) =	28.3	ft
Width of Basin Floor (W_{FLOOR}) =	16.4	ft
Area of Basin Floor (A_{FLOOR}) =	466	ft^2
Volume of Basin Floor (V_{FLOOR}) =	14	ft^3
Depth of Main Basin (H_{MAIN}) =	2.60	ft
Length of Main Basin (L_{MAIN}) =	43.9	ft
Width of Main Basin (W_{MAIN}) =	32.0	ft
Area of Main Basin (A_{MAIN}) =	1,408	ft^2
Volume of Main Basin (V_{MAIN}) =	2,326	ft^3
Calculated Total Basin Volume (V_{total}) =	**0.054**	acre-feet

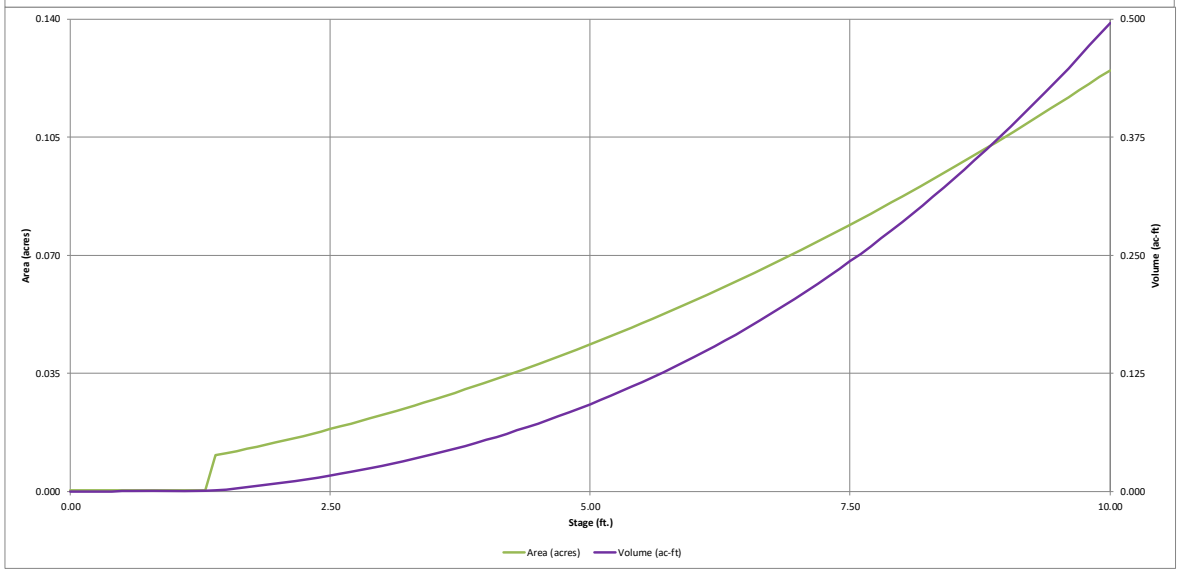
Depth Increment = 0.10 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		4.8	4.8	23		0.001		
ISV	0.33		4.8	4.8	23		0.001	8	0.000
	0.40		4.8	4.8	23		0.001	9	0.000
	0.50		4.8	4.8	23		0.001	11	0.000
	0.60		4.8	4.8	23		0.001	14	0.000
	0.70		4.8	4.8	23		0.001	16	0.000
	0.80		4.8	4.8	23		0.001	18	0.000
	0.90		4.8	4.8	23		0.001	21	0.000
	1.00		4.8	4.8	23		0.001	23	0.001
	1.10		4.8	4.8	23		0.001	25	0.001
	1.20		4.8	4.8	23		0.001	27	0.001
	1.30		4.8	4.8	23		0.001	30	0.001
Floor	1.40		28.3	16.4	466		0.011	44	0.001
	1.50		28.9	17.0	493		0.011	92	0.002
	1.60		29.5	17.6	521		0.012	143	0.003
	1.70		30.1	18.2	550		0.013	196	0.005
	1.80		30.7	18.8	579		0.013	253	0.006
	1.90		31.3	19.4	609		0.014	312	0.007
	2.00		31.9	20.0	640		0.015	375	0.009
	2.10		32.5	20.6	672		0.015	440	0.010
	2.20		33.1	21.2	704		0.016	509	0.012
	2.30		33.7	21.8	737		0.017	581	0.013
	2.40		34.3	22.4	771		0.018	657	0.015
	2.50		34.9	23.0	805		0.018	735	0.017
	2.60		35.5	23.6	840		0.019	818	0.019
	2.70		36.1	24.2	876		0.020	903	0.021
	2.80		36.7	24.8	913		0.021	993	0.023
	2.90		37.3	25.4	950		0.022	1,086	0.025
	3.00		37.9	26.0	988		0.023	1,183	0.027
	3.10		38.5	26.6	1,027		0.024	1,283	0.029
	3.20		39.1	27.2	1,066		0.024	1,388	0.032
	3.30		39.7	27.8	1,106		0.025	1,497	0.034
	3.40		40.3	28.4	1,147		0.026	1,609	0.037
	3.50		40.9	29.0	1,189		0.027	1,726	0.040
	3.60		41.5	29.6	1,231		0.028	1,847	0.042
	3.70		42.1	30.2	1,274		0.029	1,972	0.045
	3.80		42.7	30.8	1,318		0.030	2,102	0.048
	3.90		43.3	31.4	1,362		0.031	2,236	0.051
	4.00		43.9	32.0	1,408		0.032	2,375	0.055
Zone 1 (WQCV)	4.10		44.5	32.6	1,454		0.033	2,518	0.058
	4.20		45.1	33.2	1,500		0.034	2,665	0.061
	4.30		45.7	33.8	1,548		0.036	2,818	0.065
	4.40		46.3	34.4	1,596		0.037	2,975	0.068
	4.50		46.9	35.0	1,645		0.038	3,137	0.072
	4.60		47.5	35.6	1,694		0.039	3,304	0.076
	4.70		48.1	36.2	1,744		0.040	3,476	0.080
	4.80		48.7	36.8	1,795		0.041	3,653	0.084
	4.90		49.3	37.4	1,847		0.042	3,835	0.088
	5.00		49.9	38.0	1,900		0.044	4,022	0.092
	5.10		50.5	38.6	1,953		0.045	4,215	0.097
	5.20		51.1	39.2	2,007		0.046	4,413	0.101
	5.30		51.7	39.8	2,061		0.047	4,616	0.106
	5.40		52.3	40.4	2,116		0.049	4,825	0.111
	5.50		52.9	41.0	2,172		0.050	5,039	0.116
	5.60		53.5	41.6	2,229		0.051	5,259	0.121
	5.70		54.1	42.2	2,287		0.052	5,485	0.126
	5.80		54.7	42.8	2,345		0.054	5,717	0.131
	5.90		55.3	43.4	2,404		0.055	5,954	0.137
	6.00		55.9	44.0	2,463		0.057	6,198	0.142
	6.10		56.5	44.6	2,524		0.058	6,447	0.148
	6.20		57.1	45.2	2,585		0.059	6,702	0.154
	6.30		57.7	45.8	2,647		0.061	6,964	0.160
	6.40		58.3	46.4	2,709		0.062	7,232	0.166
	6.50		58.9	47.0	2,772		0.064	7,506	0.172
	6.60		59.5	47.6	2,836		0.065	7,786	0.179
	6.70		60.1	48.2	2,901		0.067	8,073	0.185
	6.80		60.7	48.8	2,966		0.068	8,366	0.192
	6.90		61.3	49.4	3,032		0.070	8,666	0.199
	7.00		61.9	50.0	3,099		0.071	8,973	0.206
	7.10		62.5	50.6	3,167		0.073	9,286	0.213
	7.20		63.1	51.2	3,235		0.074	9,606	0.221
	7.30		63.7	51.8	3,304		0.076	9,933	0.228
	7.40		64.3	52.4	3,374		0.077	10,267	0.236
	7.50		64.9	53.0	3,444		0.079	10,608	0.244
	7.60		65.5	53.6	3,515		0.081	10,956	0.252
	7.70		66.1	54.2	3,587		0.082	11,311	0.260
	7.80		66.7	54.8	3,660		0.084	11,673	0.268
	7.90		67.3	55.4	3,733		0.086	12,043	0.276
	8.00		67.9	56.0	3,807		0.087	12,420	0.285
	8.10		68.5	56.6	3,882		0.089	12,805	0.294
	8.20		69.1	57.2	3,957		0.091	13,196	0.303
	8.30		69.7	57.8	4,033		0.093	13,596	0.312
	8.40		70.3	58.4	4,110		0.094	14,003	0.321
	8.50		70.9	59.0	4,188		0.096	14,418	0.331
	8.60		71.5	59.6	4,266		0.098	14,841	0.341
	8.70		72.1	60.2	4,345		0.100	15,271	0.351
	8.80		72.7	60.8	4,425		0.102	15,710	0.361
	8.90		73.3	61.4	4,506		0.103	16,156	0.371
	9.00		73.9	62.0	4,587		0.105	16,611	0.381
	9.10		74.5	62.6	4,669		0.107	17,074	0.392
	9.20		75.1	63.2	4,752		0.109	17,545	0.403
	9.30		75.7	63.8	4,835		0.111	18,024	0.414
	9.40		76.3	64.4	4,919		0.113	18,512	0.425
	9.50		76.9	65.0	5,004		0.115	19,008	0.436
	9.60		77.5	65.6	5,089		0.117	19,513	0.448
	9.70		78.1	66.2	5,176		0.119	20,026	0.460
	9.80		78.7	66.8	5,263		0.121	20,548	0.472
	9.90		79.3	67.4	5,350		0.123	21,078	0.484
	10.00		79.9	68.0	5,439		0.125	21,618	0.496

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)



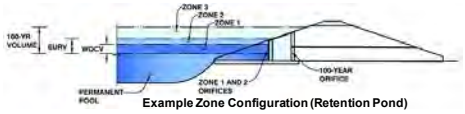


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Bennett Creek Ranch

Basin ID: Basin 3 EDB



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	EDB		
Watershed Area =	10.97	acres	
Watershed Length =	874	ft	
Watershed Length to Centroid =	410	ft	
Watershed Slope =	0.067	ft/ft	**Steep Slope > 0.06 ft/ft**
Watershed Imperviousness =	5.20%	percent	
Percentage Hydrologic Soil Group A =	100.0%	percent	
Percentage Hydrologic Soil Group B =	0.0%	percent	
Percentage Hydrologic Soil Groups C/D =	0.0%	percent	
Target WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.034	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.035	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.87 in.) =	0.004	acre-feet	0.87	inches
5-yr Runoff Volume (P1 = 1.16 in.) =	0.014	acre-feet	1.16	inches
10-yr Runoff Volume (P1 = 1.43 in.) =	0.025	acre-feet	1.43	inches
25-yr Runoff Volume (P1 = 1.85 in.) =	0.093	acre-feet	1.85	inches
50-yr Runoff Volume (P1 = 2.21 in.) =	0.291	acre-feet	2.21	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	0.559	acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3.03 in.) =	0.864	acre-feet	3.03	inches
Approximate 2-yr Detention Volume =	0.015	acre-feet		
Approximate 5-yr Detention Volume =	0.022	acre-feet		
Approximate 10-yr Detention Volume =	0.031	acre-feet		
Approximate 25-yr Detention Volume =	0.050	acre-feet		
Approximate 50-yr Detention Volume =	0.086	acre-feet		
Approximate 100-yr Detention Volume =	0.183	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.034	acre-feet	
Select Zone 2 Storage Volume (Optional) =		acre-feet	**Total detention volume is less than 100-year volume.**
Select Zone 3 Storage Volume (Optional) =		acre-feet	
Total Detention Basin Volume =	0.034	acre-feet	
Initial Surcharge Volume (ISV) =	3	ft^3	
Initial Surcharge Depth (ISD) =	0.33	ft	
Total Available Detention Depth (H_{total}) =	3.00	ft	
Depth of Trickle Channel (H_{TC}) =	1.00	ft	
Slope of Trickle Channel (S_{TC}) =	0.003	ft/ft	
Slopes of Main Basin Sides (S_{main}) =	2	H:V	**Smain not typical.**
Basin Length-to-Width Ratio ($R_{L/W}$) =	3		

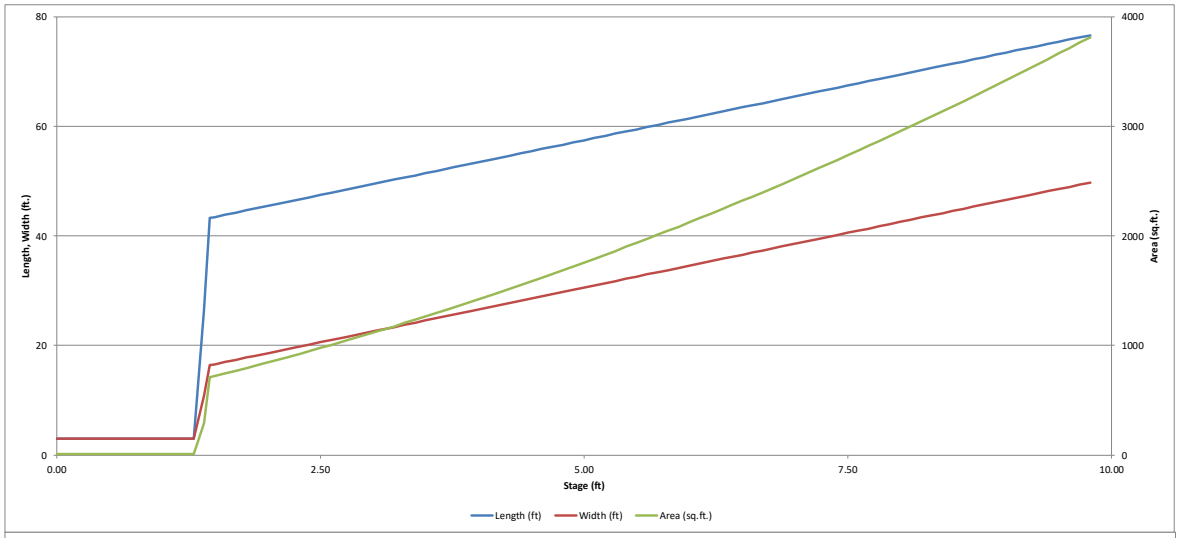
Initial Surcharge Area (A_{ISV}) =	9	ft^2
Surcharge Volume Length (L_{ISV}) =	3.0	ft
Surcharge Volume Width (W_{ISV}) =	3.0	ft
Depth of Basin Floor (H_{FLOOR}) =	0.12	ft
Length of Basin Floor (L_{FLOOR}) =	43.3	ft
Width of Basin Floor (W_{FLOOR}) =	16.3	ft
Area of Basin Floor (A_{FLOOR}) =	707	ft^2
Volume of Basin Floor (V_{FLOOR}) =	32	ft^3
Depth of Main Basin (H_{MAIN}) =	1.55	ft
Length of Main Basin (L_{MAIN}) =	49.5	ft
Width of Main Basin (W_{MAIN}) =	22.5	ft
Area of Main Basin (A_{MAIN}) =	1,115	ft^2
Volume of Main Basin (V_{MAIN}) =	1,400	ft^3
Calculated Total Basin Volume (V_{total}) =	**0.033**	acre-feet

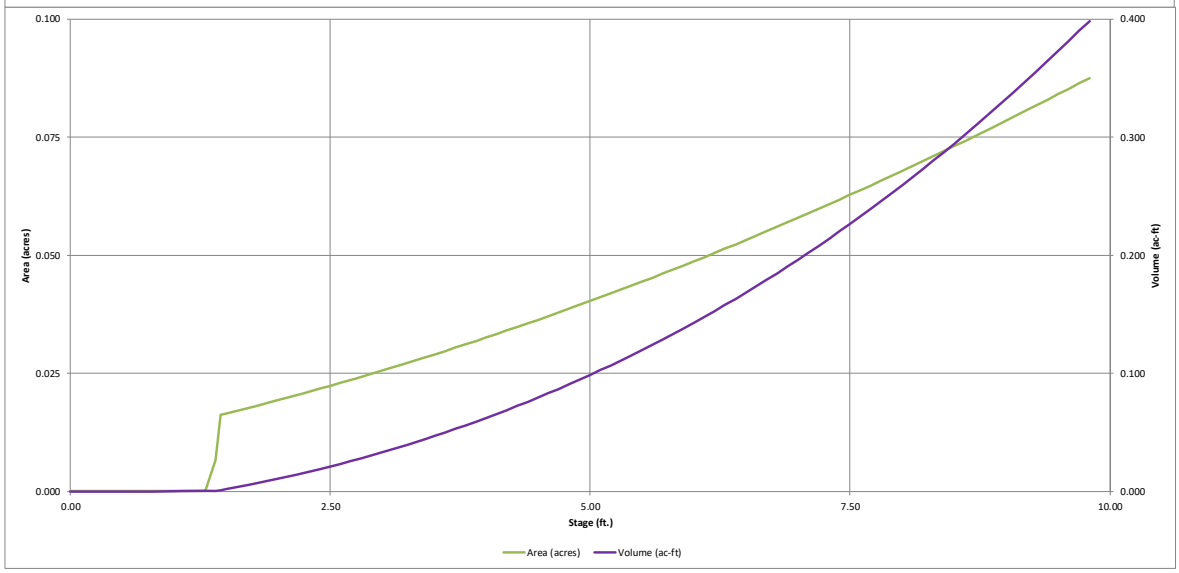
Depth Increment = 0.10 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		3.0	3.0	9		0.000		
ISV	0.33		3.0	3.0	9		0.000	3	0.000
	0.40		3.0	3.0	9		0.000	4	0.000
	0.50		3.0	3.0	9		0.000	5	0.000
	0.60		3.0	3.0	9		0.000	5	0.000
	0.70		3.0	3.0	9		0.000	6	0.000
	0.80		3.0	3.0	9		0.000	7	0.000
	0.90		3.0	3.0	9		0.000	8	0.000
	1.00		3.0	3.0	9		0.000	9	0.000
	1.10		3.0	3.0	9		0.000	10	0.000
	1.20		3.0	3.0	9		0.000	11	0.000
	1.30		3.0	3.0	9		0.000	12	0.000
	1.40		26.5	10.8	286		0.007	20	0.000
Floor	1.45		43.3	16.3	707		0.016	44	0.001
	1.50		43.5	16.5	719		0.017	80	0.002
	1.60		43.9	16.9	743		0.017	153	0.004
	1.70		44.3	17.3	768		0.018	229	0.005
	1.80		44.7	17.7	793		0.018	307	0.007
	1.90		45.1	18.1	818		0.019	387	0.009
	2.00		45.5	18.5	843		0.019	470	0.011
	2.10		45.9	18.9	869		0.020	556	0.013
	2.20		46.3	19.3	895		0.021	644	0.015
	2.30		46.7	19.7	921		0.021	735	0.017
	2.40		47.1	20.1	948		0.022	828	0.019
	2.50		47.5	20.5	975		0.022	924	0.021
	2.60		47.9	20.9	1,002		0.023	1,023	0.023
	2.70		48.3	21.3	1,030		0.024	1,125	0.026
	2.80		48.7	21.7	1,058		0.024	1,229	0.028
	2.90		49.1	22.1	1,086		0.025	1,337	0.031
	3.00		49.5	22.5	1,115		0.026	1,447	0.033
Zone 1 (WQCV)	3.05		49.7	22.7	1,130		0.026	1,503	0.034
	3.10		49.9	22.9	1,144		0.026	1,560	0.036
	3.20		50.3	23.3	1,173		0.027	1,676	0.038
	3.30		50.7	23.7	1,203		0.028	1,794	0.041
	3.40		51.1	24.1	1,233		0.028	1,916	0.044
	3.50		51.5	24.5	1,263		0.029	2,041	0.047
	3.60		51.9	24.9	1,294		0.030	2,169	0.050
	3.70		52.3	25.3	1,325		0.030	2,300	0.053
	3.80		52.7	25.7	1,356		0.031	2,434	0.056
	3.90		53.1	26.1	1,387		0.032	2,571	0.059
	4.00		53.5	26.5	1,419		0.033	2,711	0.062
	4.10		53.9	26.9	1,451		0.033	2,855	0.066
	4.20		54.3	27.3	1,484		0.034	3,001	0.069
	4.30		54.7	27.7	1,517		0.035	3,151	0.072
	4.40		55.1	28.1	1,550		0.036	3,305	0.076
	4.50		55.5	28.5	1,583		0.036	3,461	0.079
	4.60		55.9	28.9	1,617		0.037	3,621	0.083
	4.70		56.3	29.3	1,651		0.038	3,785	0.087
	4.80		56.7	29.7	1,685		0.039	3,952	0.091
	4.90		57.1	30.1	1,720		0.039	4,122	0.095
	5.00		57.5	30.5	1,755		0.040	4,296	0.099
	5.10		57.9	30.9	1,791		0.041	4,473	0.103
	5.20		58.3	31.3	1,826		0.042	4,654	0.107
	5.30		58.7	31.7	1,862		0.043	4,838	0.111
	5.40		59.1	32.1	1,899		0.044	5,026	0.115
	5.50		59.5	32.5	1,935		0.044	5,218	0.120
	5.60		59.9	32.9	1,972		0.045	5,413	0.124
	5.70		60.3	33.3	2,009		0.046	5,612	0.129
	5.80		60.7	33.7	2,047		0.047	5,815	0.133
	5.90		61.1	34.1	2,085		0.048	6,022	0.138
	6.00		61.5	34.5	2,123		0.049	6,232	0.143
	6.10		61.9	34.9	2,162		0.050	6,446	0.148
	6.20		62.3	35.3	2,201		0.051	6,665	0.153
	6.30		62.7	35.7	2,240		0.051	6,887	0.158
	6.40		63.1	36.1	2,279		0.052	7,112	0.163
	6.50		63.5	36.5	2,319		0.053	7,342	0.169
	6.60		63.9	36.9	2,359		0.054	7,576	0.174
	6.70		64.3	37.3	2,400		0.055	7,814	0.179
	6.80		64.7	37.7	2,441		0.056	8,056	0.185
	6.90		65.1	38.1	2,482		0.057	8,302	0.191
	7.00		65.5	38.5	2,523		0.058	8,553	0.196
	7.10		65.9	38.9	2,565		0.059	8,807	0.202
	7.20		66.3	39.3	2,607		0.060	9,066	0.208
	7.30		66.7	39.7	2,649		0.061	9,328	0.214
	7.40		67.1	40.1	2,692		0.062	9,596	0.220
	7.50		67.5	40.5	2,735		0.063	9,867	0.227
	7.60		67.9	40.9	2,779		0.064	10,143	0.233
	7.70		68.3	41.3	2,822		0.065	10,423	0.239
	7.80		68.7	41.7	2,866		0.066	10,707	0.246
	7.90		69.1	42.1	2,911		0.067	10,996	0.252
	8.00		69.5	42.5	2,955		0.068	11,289	0.259
	8.10		69.9	42.9	3,000		0.069	11,587	0.266
	8.20		70.3	43.3	3,045		0.070	11,889	0.273
	8.30		70.7	43.7	3,091		0.071	12,196	0.280
	8.40		71.1	44.1	3,137		0.072	12,507	0.287
	8.50		71.5	44.5	3,183		0.073	12,823	0.294
	8.60		71.9	44.9	3,230		0.074	13,144	0.302
	8.70		72.3	45.3	3,277		0.075	13,469	0.309
	8.80		72.7	45.7	3,324		0.076	13,799	0.317
	8.90		73.1	46.1	3,371		0.077	14,134	0.324
	9.00		73.5	46.5	3,419		0.078	14,474	0.332
	9.10		73.9	46.9	3,467		0.080	14,818	0.340
	9.20		74.3	47.3	3,516		0.081	15,167	0.348
	9.30		74.7	47.7	3,565		0.082	15,521	0.356
	9.40		75.1	48.1	3,614		0.083	15,880	0.365
	9.50		75.5	48.5	3,663		0.084	16,244	0.373
	9.60		75.9	48.9	3,713		0.085	16,613	0.381
	9.70		76.3	49.3	3,763		0.086	16,987	0.390
	9.80		76.7	49.7	3,813		0.088	17,365	0.399

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)





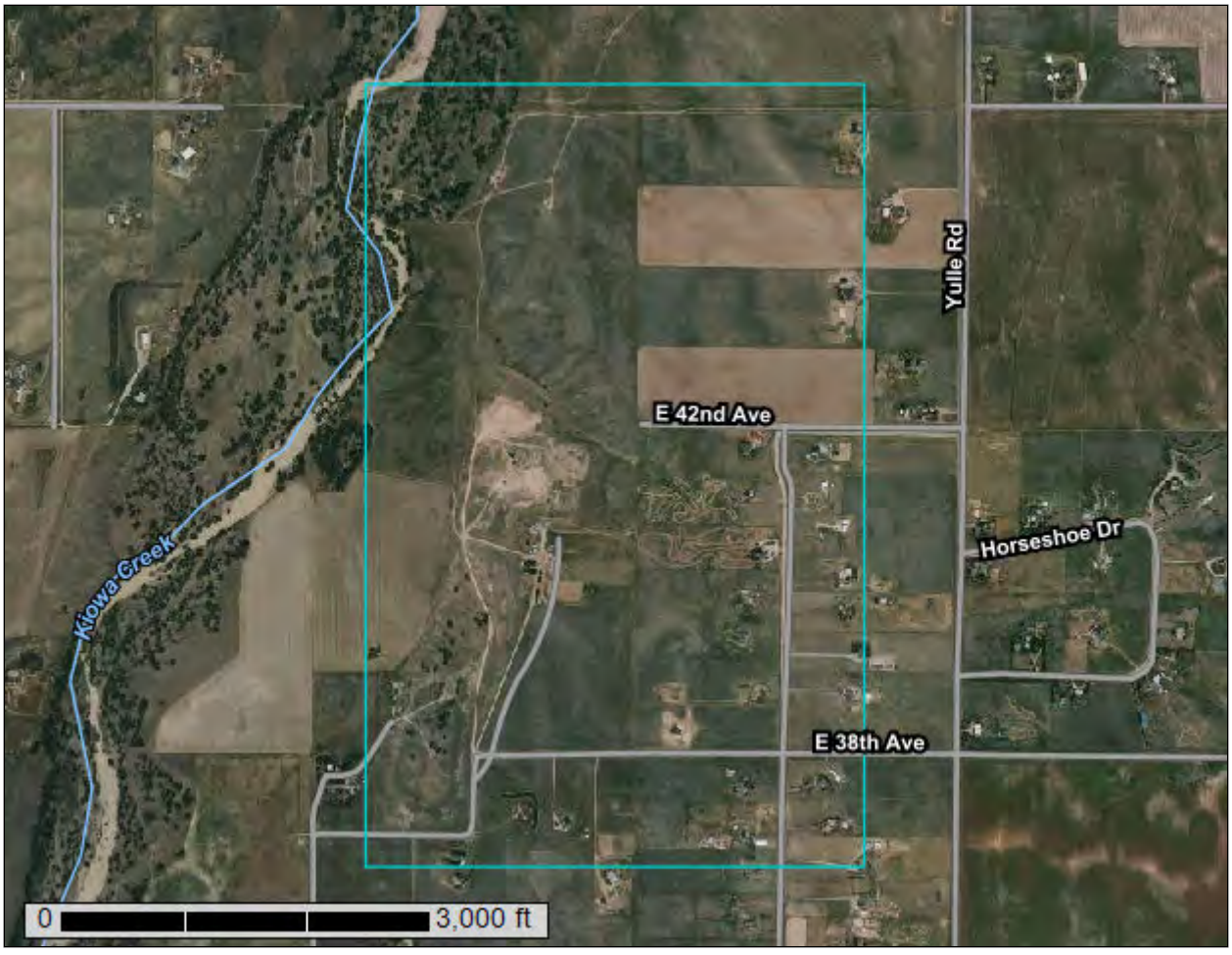
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Adams County Area, Parts of Adams and Denver Counties, Colorado



August 15, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

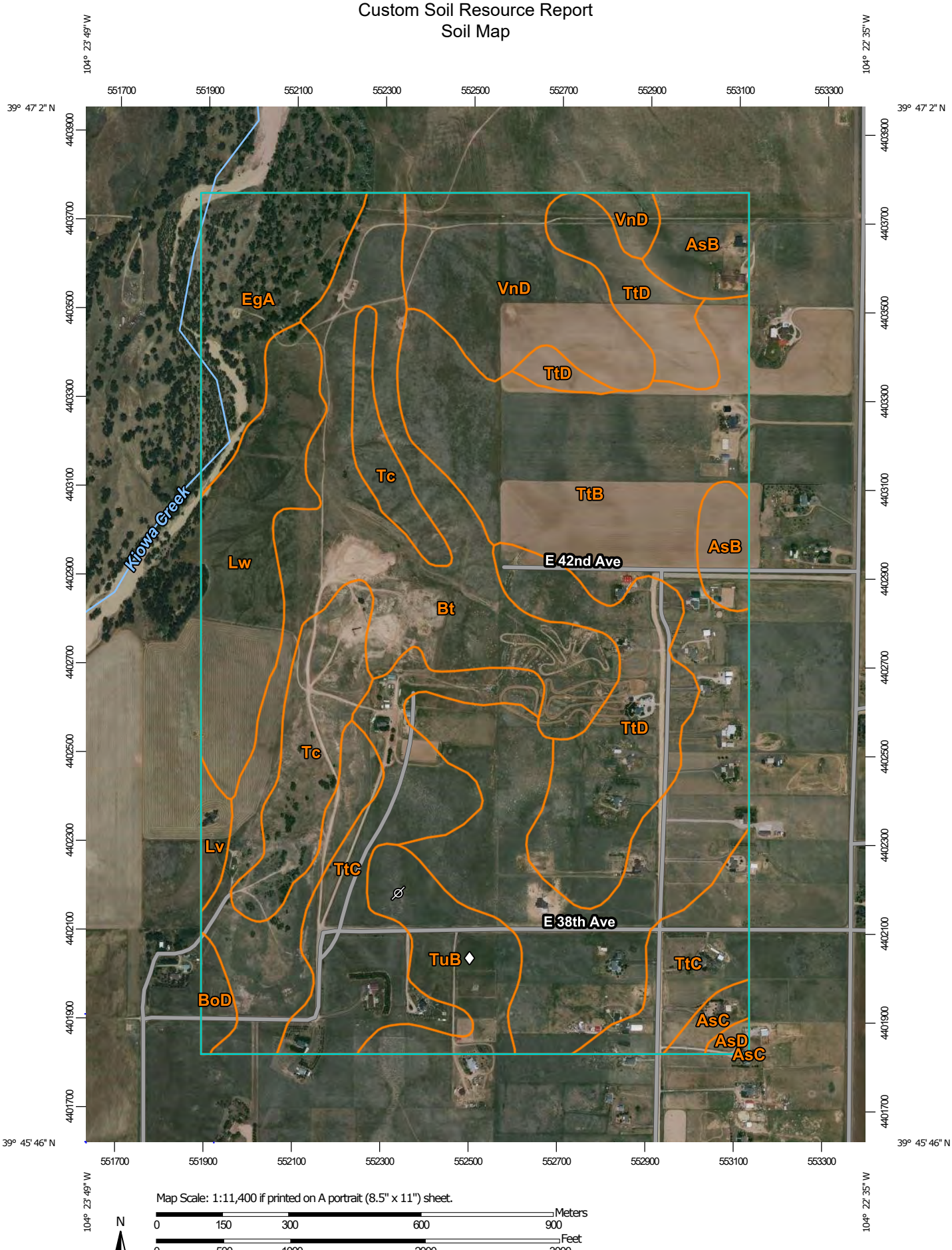
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Adams County Area, Parts of Adams and Denver Counties, Colorado
Survey Area Data: Version 21, Aug 29, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AsB	Ascalon sandy loam, 0 to 3 percent slopes	19.5	3.3%
AsC	Ascalon sandy loam, 3 to 5 percent slopes	3.7	0.6%
AsD	Ascalon sandy loam, 5 to 9 percent slopes	1.3	0.2%
BoD	Blakeland loamy sand, 3 to 9 percent slopes	3.7	0.6%
Bt	Blakeland-Truckton association	103.9	17.4%
EgA	Ellicott-Glenberg complex, 0 to 3 percent slopes, occasionally flooded	33.7	5.6%
Lv	Loamy alluvial land, gravelly substratum	3.9	0.6%
Lw	Loamy alluvial land, moderately wet	40.1	6.7%
Tc	Terrace escarpments	35.7	6.0%
TtB	Truckton loamy sand, 0 to 3 percent slopes	157.0	26.3%
TtC	Truckton loamy sand, 3 to 5 percent slopes	64.9	10.9%
TtD	Truckton loamy sand, 5 to 9 percent slopes	62.2	10.4%
TuB	Truckton sandy loam, 0 to 3 percent slopes	23.7	4.0%
VnD	Vona loamy sand, 3 to 9 percent slopes	43.7	7.3%
Totals for Area of Interest		**596.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without

including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Adams County Area, Parts of Adams and Denver Counties, Colorado

AsB—Ascalon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2swl3
Elevation: 3,870 to 5,960 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 135 to 160 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Ascalon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk - 19 to 35 inches: sandy clay loam
C - 35 to 80 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Olnest

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Vona

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

AsC—Ascalon sandy loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2tlnt
Elevation: 3,550 to 5,970 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 135 to 160 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Ascalon and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam

Bt2 - 12 to 19 inches: sandy clay loam
Bk - 19 to 35 inches: sandy clay loam
C - 35 to 80 inches: sandy loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.1 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: R072XY111KS - Sandy Plains, R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Stoneham

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R072XY100KS - Loamy Tableland , R067BY002CO - Loamy Plains
Hydric soil rating: No

Vona

Percent of map unit: 8 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R072XY111KS - Sandy Plains, R067BY024CO - Sandy Plains
Hydric soil rating: No

Platner

Percent of map unit: 2 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear

Ecological site: R072XY100KS - Loamy Tableland , R067BY002CO - Loamy Plains
Hydric soil rating: No

AsD—Ascalon sandy loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2tlmx
Elevation: 3,870 to 6,070 feet
Mean annual precipitation: 13 to 16 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 135 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Ascalon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk - 19 to 35 inches: sandy clay loam
C - 35 to 80 inches: sandy loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Stoneham
Percent of map unit: 10 percent
Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY002CO - Loamy Plains
Hydric soil rating: No

Manter
Percent of map unit: 5 percent
Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

BoD—Blakeland loamy sand, 3 to 9 percent slopes

Map Unit Setting
National map unit symbol: 34vs
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 135 to 155 days

Map Unit Composition
Blakeland and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting
Landform: Plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed and/or eolian deposits derived from mixed

Typical profile
H1 - 0 to 9 inches: loamy sand
H2 - 9 to 60 inches: sand

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Minor Components

Truckton

Percent of map unit: 5 percent
Hydric soil rating: No

Bt—Blakeland-Truckton association

Map Unit Setting

National map unit symbol: 34vt
Elevation: 4,400 to 6,000 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 125 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 60 percent
Truckton and similar soils: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Alluvium derived from mixed and/or eolian deposits derived from mixed

Typical profile

H1 - 0 to 9 inches: loamy sand
H2 - 9 to 60 inches: sand

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Description of Truckton

Setting

Landform: Plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from mixed

Typical profile

H1 - 0 to 9 inches: loamy sand
H2 - 9 to 21 inches: sandy loam
H3 - 21 to 32 inches: loamy sand
H4 - 32 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A

Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Minor Components

Valent
Percent of map unit: 10 percent
Hydric soil rating: No

Vona
Percent of map unit: 10 percent
Hydric soil rating: No

EgA—Ellicott-Glenberg complex, 0 to 3 percent slopes, occasionally flooded

Map Unit Setting
National map unit symbol: 2x0j6
Elevation: 3,950 to 5,960 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 135 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition
Ellicott, occasionally flooded, and similar soils: 65 percent
Glenberg, rarely flooded, and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ellicott, Occasionally Flooded

Setting
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Noncalcareous, stratified sandy alluvium

Typical profile
A - 0 to 4 inches: sand
AC - 4 to 13 inches: sand
C1 - 13 to 30 inches: sand
C2 - 30 to 44 inches: sand
C3 - 44 to 80 inches: coarse sand

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 39.96 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R067BY031CO - Sandy Bottomland
Hydric soil rating: No

Description of Glenberg, Rarely Flooded

Setting

Landform: Flood-plain steps, ephemeral streams
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified, calcareous alluvium

Typical profile

A - 0 to 6 inches: sandy loam
AC - 6 to 18 inches: sandy loam
C1 - 18 to 45 inches: sandy loam
C2 - 45 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: A
Ecological site: R067BY031CO - Sandy Bottomland
Hydric soil rating: No

Minor Components

Las animas, occasionally flooded

Percent of map unit: 10 percent
Landform: Ephemeral streams, flood plains
Down-slope shape: Linear

Across-slope shape: Linear, concave
Ecological site: R067BY038CO - Wet Meadow
Hydric soil rating: No

Ellicott sandy-skeletal, occasionally flooded
Percent of map unit: 5 percent
Landform: Flood plains, channels
Down-slope shape: Linear
Across-slope shape: Linear, concave
Ecological site: R067BY031CO - Sandy Bottomland
Hydric soil rating: No

Lv—Loamy alluvial land, gravelly substratum

Map Unit Setting
National map unit symbol: 34w4
Elevation: 4,000 to 8,500 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 75 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition
Loamy alluvial land: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loamy Alluvial Land

Setting
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed

Typical profile
H1 - 0 to 20 inches: loam
H2 - 20 to 60 inches: stratified very gravelly sand to clay

Properties and qualities
Slope: 0 to 2 percent
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Frequency of flooding: Occasional
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Dacono

Percent of map unit: 10 percent
Hydric soil rating: No

Nunn

Percent of map unit: 10 percent
Hydric soil rating: No

Halaquepts

Percent of map unit: 5 percent
Landform: Terraces
Hydric soil rating: Yes

Lw—Loamy alluvial land, moderately wet

Map Unit Setting

National map unit symbol: 34w5
Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Loamy alluvial land: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loamy Alluvial Land

Setting

Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed

Typical profile

H1 - 0 to 6 inches: variable
H2 - 6 to 36 inches: stratified loam to clay loam
H3 - 36 to 60 inches: sand

Properties and qualities

Slope: 0 to 1 percent

Drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: Occasional
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Nunn

Percent of map unit: 12 percent
Hydric soil rating: No

Satanta

Percent of map unit: 12 percent
Landform: Paleoterraces
Hydric soil rating: No

Fluvaquentic haplustolls

Percent of map unit: 6 percent
Landform: Sloughs
Hydric soil rating: Yes

Tc—Terrace escarpments

Map Unit Setting

National map unit symbol: 34ws
Elevation: 4,400 to 5,500 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Terrace escarpments: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Terrace Escarpments

Setting

Landform: Terraces

Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed

Typical profile

H1 - 0 to 3 inches: gravelly sand
H2 - 3 to 60 inches: gravelly sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R067BY063CO - Gravel Breaks
Hydric soil rating: No

Minor Components

Dacono

Percent of map unit: 5 percent
Hydric soil rating: No

Vona

Percent of map unit: 5 percent
Hydric soil rating: No

TtB—Truckton loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2yvrl
Elevation: 4,200 to 5,600 feet
Mean annual precipitation: 12 to 17 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 125 to 155 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Truckton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Interfluves, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind re-worked alluvium derived from arkose

Typical profile

A - 0 to 6 inches: loamy sand

Bt1 - 6 to 10 inches: sandy loam
Bt2 - 10 to 16 inches: sandy loam
C - 16 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Blakeland

Percent of map unit: 8 percent
Landform: Hills, interfluves
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Vona

Percent of map unit: 5 percent
Landform: Hills, dunes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Bresser

Percent of map unit: 5 percent
Landform: Interfluves, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Urban land
Percent of map unit: 2 percent
Hydric soil rating: No

TtC—Truckton loamy sand, 3 to 5 percent slopes

Map Unit Setting
National map unit symbol: 31gjy
Elevation: 4,200 to 5,600 feet
Mean annual precipitation: 12 to 17 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 125 to 155 days

Map Unit Composition
Truckton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting
Landform: Hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind re-worked alluvium derived from arkose

Typical profile
A - 0 to 6 inches: loamy sand
Bt1 - 6 to 10 inches: sandy loam
Bt2 - 10 to 16 inches: sandy loam
C - 16 to 80 inches: loamy coarse sand

Properties and qualities
Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.13 to 7.09 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups
Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Vona

Percent of map unit: 8 percent
Landform: Hills, dunes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Valent

Percent of map unit: 5 percent
Landform: Dunes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Blakeland

Percent of map unit: 3 percent
Landform: Hills, interfluves
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Bresser

Percent of map unit: 2 percent
Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Urban land

Percent of map unit: 2 percent
Hydric soil rating: No

TtD—Truckton loamy sand, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 31gjz
Elevation: 4,200 to 5,600 feet
Mean annual precipitation: 12 to 17 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 125 to 155 days

Map Unit Composition

Truckton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Wind re-worked alluvium derived from arkose

Typical profile

A - 0 to 6 inches: loamy sand
Bt1 - 6 to 10 inches: sandy loam
Bt2 - 10 to 16 inches: sandy loam
C - 16 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.13 to 7.09 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Minor Components

Valent

Percent of map unit: 8 percent
Landform: Dunes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Vona

Percent of map unit: 7 percent
Landform: Hills, dunes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Blakeland

Percent of map unit: 2 percent
Landform: Hills, interfluves
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Urban land

Percent of map unit: 2 percent
Hydric soil rating: No

Bresser

Percent of map unit: 1 percent
Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

TuB—Truckton sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2yvrf
Elevation: 4,600 to 6,100 feet
Mean annual precipitation: 12 to 17 inches

Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 125 to 155 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Truckton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Terraces, interfluves
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind re-worked alluvium derived from arkose

Typical profile

A - 0 to 6 inches: sandy loam
Bt1 - 6 to 10 inches: sandy loam
Bt2 - 10 to 16 inches: sandy loam
C - 16 to 80 inches: loamy coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Minor Components

Bresser

Percent of map unit: 4 percent
Landform: Terraces, interfluves
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Vona

Percent of map unit: 4 percent
Landform: Hills, dunes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Blakeland

Percent of map unit: 3 percent
Landform: Hills, interfluves
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Pleasant, frequently ponded

Percent of map unit: 2 percent
Landform: Closed depressions
Down-slope shape: Linear, concave
Across-slope shape: Concave
Ecological site: R067BY010CO - Closed Depression
Hydric soil rating: Yes

Urban land

Percent of map unit: 2 percent
Hydric soil rating: No

VnD—Vona loamy sand, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2x0j7
Elevation: 4,000 to 5,600 feet
Mean annual precipitation: 12 to 17 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 130 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Vona and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vona

Setting

Landform: Hills, hillslopes
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Eolian sands

Typical profile

A - 0 to 7 inches: loamy sand
Bt1 - 7 to 14 inches: sandy loam
Bt2 - 14 to 20 inches: sandy loam
Bk - 20 to 45 inches: sandy loam
C - 45 to 80 inches: loamy sand

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.1 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

Minor Components

Manter

Percent of map unit: 5 percent
Landform: Hills, interfluves
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope, interfluve
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Ascalon

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear

Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Olnest

Percent of map unit: 3 percent
Landform: Hills, interfluves
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, interfluve
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Ecological site: R067BY024CO - Sandy Plains
Hydric soil rating: No

Valent

Percent of map unit: 2 percent
Landform: Dunes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R067BY015CO - Deep Sand
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

NOAA Atlas 14, Volume 8, Version 2
Location name: Bennett, Colorado, USA*
Latitude: 39.7558°, Longitude: -104.4274°
Elevation: 5487 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.240** (0.196-0.296)	**0.296** (0.241-0.365)	**0.397** (0.322-0.491)	**0.490** (0.395-0.609)	**0.631** (0.496-0.825)	**0.751** (0.572-0.989)	**0.879** (0.644-1.18)	**1.02** (0.712-1.41)	**1.22** (0.815-1.72)	**1.38** (0.893-1.96)
10-min	**0.352** (0.287-0.433)	**0.434** (0.353-0.535)	**0.582** (0.472-0.719)	**0.718** (0.579-0.891)	**0.925** (0.726-1.21)	**1.10** (0.837-1.45)	**1.29** (0.943-1.73)	**1.49** (1.04-2.06)	**1.78** (1.19-2.52)	**2.02** (1.31-2.87)
15-min	**0.429** (0.350-0.529)	**0.529** (0.431-0.652)	**0.709** (0.576-0.877)	**0.875** (0.706-1.09)	**1.13** (0.885-1.47)	**1.34** (1.02-1.77)	**1.57** (1.15-2.11)	**1.82** (1.27-2.51)	**2.18** (1.46-3.08)	**2.46** (1.59-3.50)
30-min	**0.578** (0.471-0.712)	**0.709** (0.578-0.875)	**0.948** (0.770-1.17)	**1.17** (0.943-1.45)	**1.51** (1.18-1.97)	**1.80** (1.37-2.37)	**2.10** (1.54-2.84)	**2.44** (1.71-3.37)	**2.93** (1.96-4.14)	**3.32** (2.15-4.72)
60-min	**0.715** (0.583-0.882)	**0.871** (0.710-1.08)	**1.16** (0.941-1.44)	**1.43** (1.15-1.78)	**1.85** (1.46-2.43)	**2.21** (1.69-2.92)	**2.60** (1.91-3.51)	**3.03** (2.12-4.19)	**3.65** (2.44-5.17)	**4.16** (2.69-5.91)
2-hr	**0.852** (0.699-1.04)	**1.03** (0.847-1.27)	**1.37** (1.12-1.68)	**1.69** (1.37-2.09)	**2.19** (1.74-2.86)	**2.63** (2.02-3.45)	**3.10** (2.29-4.16)	**3.62** (2.56-4.97)	**4.38** (2.96-6.15)	**5.00** (3.26-7.04)
3-hr	**0.935** (0.769-1.14)	**1.13** (0.926-1.37)	**1.49** (1.22-1.82)	**1.83** (1.49-2.25)	**2.38** (1.89-3.09)	**2.85** (2.20-3.72)	**3.36** (2.50-4.49)	**3.93** (2.79-5.38)	**4.76** (3.23-6.66)	**5.44** (3.57-7.64)
6-hr	**1.11** (0.919-1.34)	**1.33** (1.10-1.61)	**1.73** (1.43-2.10)	**2.12** (1.74-2.58)	**2.72** (2.18-3.51)	**3.25** (2.52-4.21)	**3.82** (2.86-5.06)	**4.45** (3.18-6.03)	**5.36** (3.67-7.44)	**6.11** (4.04-8.50)
12-hr	**1.34** (1.12-1.61)	**1.60** (1.33-1.92)	**2.06** (1.71-2.48)	**2.49** (2.05-3.01)	**3.14** (2.53-4.00)	**3.70** (2.89-4.74)	**4.30** (3.23-5.63)	**4.95** (3.56-6.64)	**5.89** (4.06-8.08)	**6.65** (4.43-9.17)
24-hr	**1.61** (1.34-1.91)	**1.91** (1.60-2.28)	**2.44** (2.04-2.92)	**2.92** (2.42-3.50)	**3.61** (2.91-4.52)	**4.19** (3.28-5.29)	**4.80** (3.62-6.20)	**5.45** (3.94-7.21)	**6.36** (4.41-8.63)	**7.09** (4.77-9.70)
2-day	**1.87** (1.58-2.22)	**2.22** (1.87-2.63)	**2.82** (2.36-3.34)	**3.33** (2.78-3.96)	**4.06** (3.28-5.02)	**4.66** (3.67-5.81)	**5.27** (4.00-6.73)	**5.91** (4.30-7.74)	**6.80** (4.75-9.12)	**7.49** (5.09-10.2)
3-day	**2.04** (1.73-2.41)	**2.40** (2.03-2.83)	**3.01** (2.53-3.56)	**3.53** (2.96-4.19)	**4.28** (3.47-5.26)	**4.88** (3.86-6.06)	**5.50** (4.20-6.99)	**6.15** (4.50-8.01)	**7.04** (4.94-9.40)	**7.74** (5.28-10.5)
4-day	**2.17** (1.84-2.55)	**2.54** (2.15-2.98)	**3.16** (2.67-3.72)	**3.69** (3.10-4.36)	**4.45** (3.62-5.44)	**5.06** (4.01-6.26)	**5.68** (4.35-7.19)	**6.34** (4.65-8.22)	**7.24** (5.10-9.62)	**7.94** (5.44-10.7)
7-day	**2.47** (2.11-2.89)	**2.87** (2.45-3.36)	**3.54** (3.00-4.14)	**4.11** (3.46-4.82)	**5.33** (4.00-5.95)	**5.54** (4.41-6.79)	**6.18** (4.76-7.76)	**6.85** (5.05-8.81)	**7.75** (5.50-10.2)	**8.45** (5.83-11.3)
10-day	**2.74** (2.34-3.18)	**3.18** (2.71-3.69)	**3.89** (3.31-4.53)	**4.49** (3.80-5.26)	**5.33** (4.36-6.42)	**5.99** (4.78-7.30)	**6.65** (5.13-8.30)	**7.33** (5.43-9.37)	**8.24** (5.87-10.8)	**8.94** (6.20-11.9)
20-day	**3.54** (3.05-4.08)	**4.07** (3.49-4.69)	**4.92** (4.21-5.69)	**5.62** (4.78-6.52)	**6.58** (5.41-7.84)	**7.31** (5.88-8.83)	**8.04** (6.25-9.93)	**8.78** (6.54-11.1)	**9.74** (6.99-12.6)	**10.5** (7.32-13.8)
30-day	**4.20** (3.63-4.82)	**4.81** (4.15-5.53)	**5.79** (4.98-6.66)	**6.58** (5.63-7.61)	**7.65** (6.31-9.05)	**8.46** (6.82-10.1)	**9.25** (7.22-11.3)	**10.0** (7.51-12.6)	**11.0** (7.96-14.2)	**11.9** (8.30-15.5)
45-day	**5.02** (4.35-5.74)	**5.75** (4.97-6.57)	**6.90** (5.95-7.91)	**7.83** (6.71-9.00)	**9.05** (7.47-10.6)	**9.95** (8.05-11.9)	**10.8** (8.47-13.2)	**11.7** (8.77-14.6)	**12.7** (9.22-16.3)	**13.5** (9.56-17.6)
60-day	**5.70** (4.95-6.49)	**6.54** (5.67-7.45)	**7.86** (6.79-8.97)	**8.90** (7.65-10.2)	**10.3** (8.49-12.0)	**11.2** (9.12-13.3)	**12.2** (9.56-14.8)	**13.1** (9.87-16.3)	**14.2** (10.3-18.1)	**15.0** (10.6-19.5)

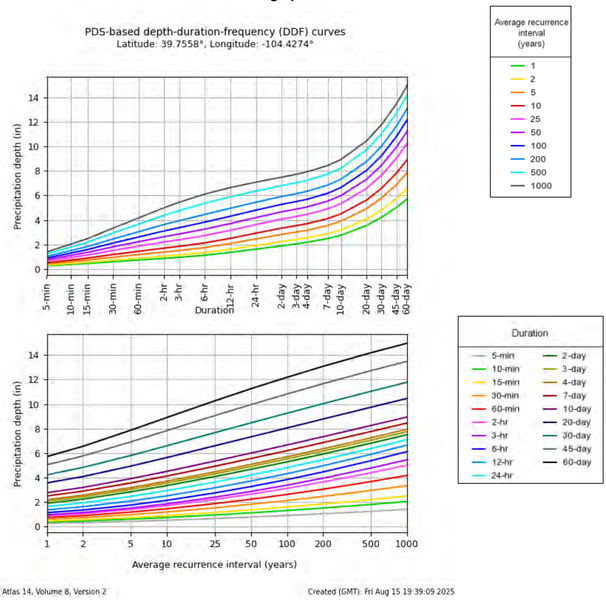
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

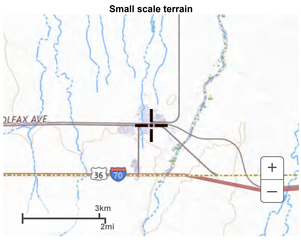


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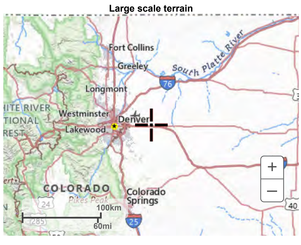
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Maps & aerials

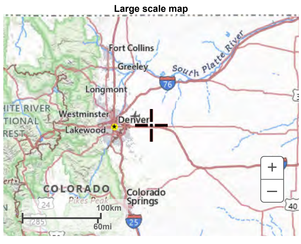
Small scale terrain



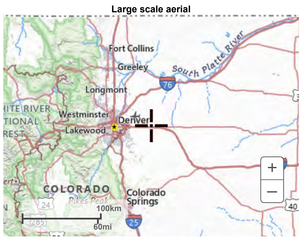
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

LEGEND

BOUNDARIES
- DRMS Permit Boundary
- 200 ft Offset of DRMS Permit Boundary

BUILDINGS AND RELATED STRUCTURES
- Buildings
- Fence

LAND SURVEYS
- Section line
- Property Boundary
- Mining Claim

ROADS AND RELATED FEATURES
- Light duty road, gravel

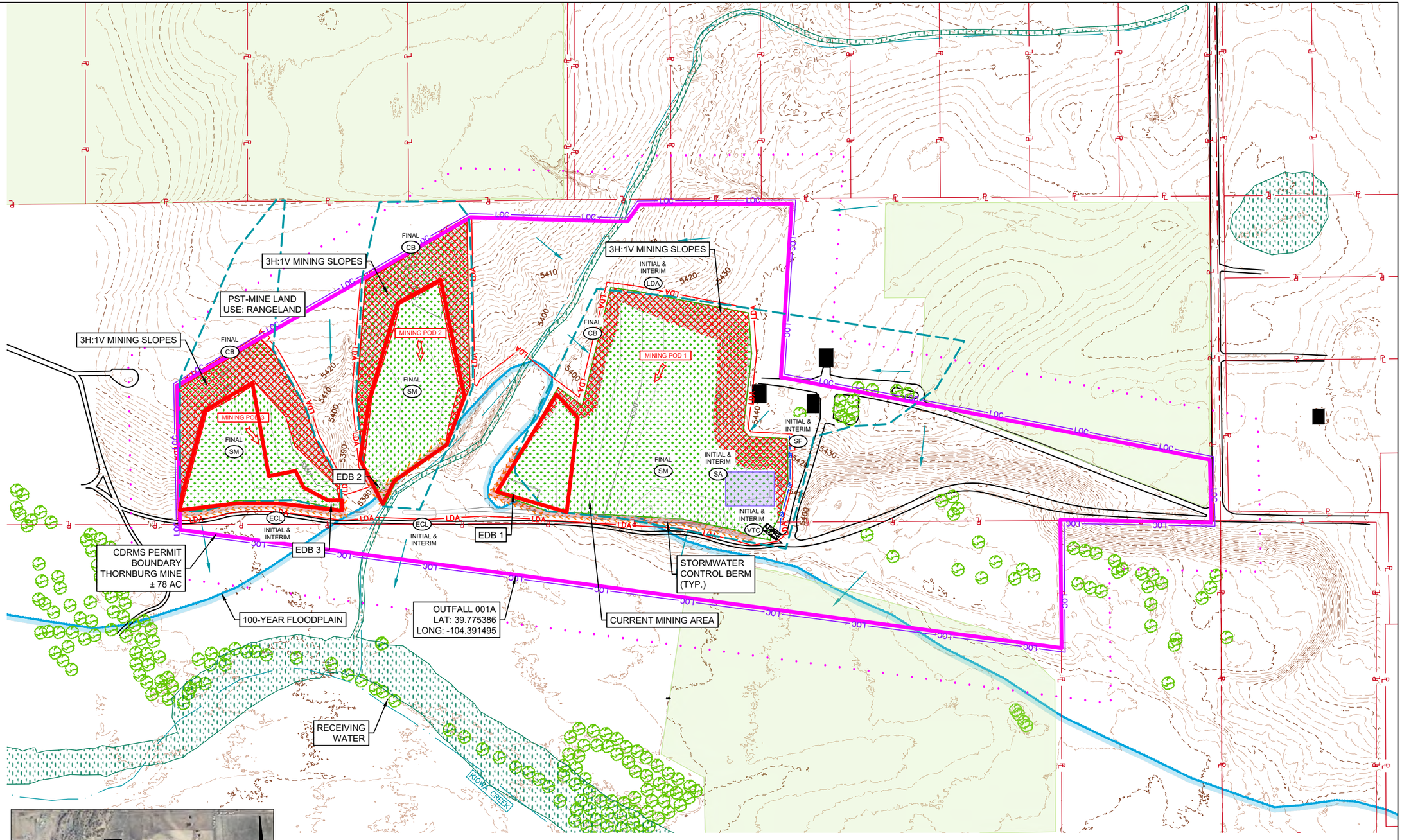
RIVERS, LAKES, SHORELINES, AND CANALS
- Perennial Stream/Ditch
- Intermittent Stream/Ditch
- Drainage Basin Limits
- Drainage Direction
- 100-Yr Floodplain

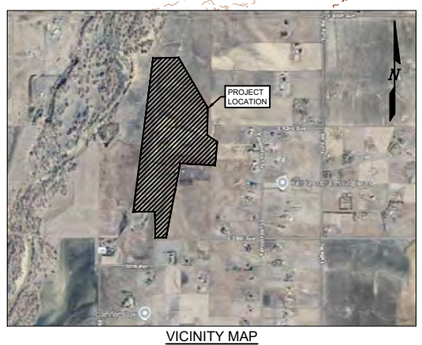
MINING FEATURES
- Berm
- Berm/windrow
- Buried Water Structures

CONTOURS
- Existing Major Contour — 5280'
- Existing Minor Contour — 5281'
- Post-Mining Major Contour — 5280'
- Post-Mining Minor Contour — 5281'

VEGETATION
- Agricultural Fields
- National Wetlands Inventory
- Existing Trees or Shrubs

SWMP LABELS
- Limits of Disturbance — LDA
- Limits of Construction — LOC
- Erosion Control Log (Type 1) — ECL
- Vehicle Tracking Control — VTC
- Silt Fence — SF
- Compost Blanket (Coconut)(Biodegradable Class 2) — CB
- Seeding & Mulching — SM
- Staging Area — SA





VICINITY MAP
N.T.S.

"I HEREBY CERTIFY THAT THIS EROSION CONTROL DRAWING FOR THORNBURG PIT WAS PREPARED BY ME (OR UNDER MY DIRECT SUPERVISION) IN ACCORDANCE WITH THE PROVISIONS OF ADAMS COUNTY STORM DRAINAGE DESIGN AND STORMWATER QUALITY REGULATIONS FOR THE OWNERS THEREOF."

REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 47151

DATE

Erosion Control Plan

Thornburg Pit

DRMS Permit Number: M1983060 — Bennett Creek Ranch LLC

Mine Entry Location:	Latitude: ----	Longitude: ----
State: CO	County: Adams	Nearest Town: Bennett
Section: 24	Township: 3S	Range: 63W PM: 6th
Major Watershed:	Kiowa Creek	

Map Scale: 1" = 200'

0 — 200' — 400'

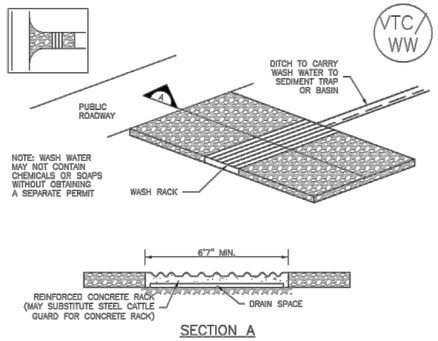
Map Georeferencing Information: Datum: NAD83 — Projection: CO CENTRAL

Survey Source: CO LIDAR	**Drawn by:** LLD	Date: 8/28/2025
Imagery Source: Google	**Checked by:** BEL	Date: 11/24/24
Survey Date: 2013	**Approved by:** BEL	Date: 11/24/24
Imagery Date: 2024		

File Name: Thornburg Pit

.\IMAGES\Basic Logo.png

3375 West Powers Circle
Littleton, CO USA 80123
(303)-346-5196
info@lewicki.biz



VTC–2. AGGREGATE VEHICLE TRACKING CONTROL WITH WASH RACK

STABILIZED CONSTRUCTION ENTRANCE/EXIT INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   –LOCATION OF CONSTRUCTION ENTRANCE(S)/EXIT(S).
   –TYPE OF CONSTRUCTION ENTRANCE(S)/EXITS(S) (WITH/WITHOUT WHEEL WASH, CONSTRUCTION MAT OR TRM).

2. CONSTRUCTION MAT OR TRM STABILIZED CONSTRUCTION ENTRANCES ARE ONLY TO BE USED ON SHORT DURATION PROJECTS (TYPICALLY RANGING FROM A WEEK TO A MONTH) WHERE THERE WILL BE LIMITED VEHICULAR ACCESS.

3. A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE LOCATED AT ALL ACCESS POINTS WHERE VEHICLES ACCESS THE CONSTRUCTION SITE FROM PAVED RIGHT–OF–WAYS.

4. STABILIZED CONSTRUCTION ENTRANCE/EXIT SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

5. A NON–WOVEN GEOTEXTILE FABRIC SHALL BE PLACED UNDER THE STABILIZED CONSTRUCTION ENTRANCE/EXIT PRIOR TO THE PLACEMENT OF ROCK.

6. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.

STABILIZED CONSTRUCTION ENTRANCE/EXIT MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY TO THE STABILIZED ENTRANCE/EXIT TO MAINTAIN A CONSISTENT DEPTH.

5. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED THROUGHOUT THE DAY AND AT THE END OF THE DAY BY SHOVELING OR SWEEPING. SEDIMENT MAY NOT BE WASHED DOWN STORM SEWER DRAINS.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM CITY OF BROOMFIELD, COLORADO, NOT AVAILABLE IN AUTOCAD)

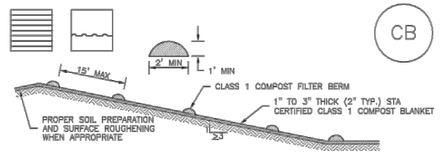
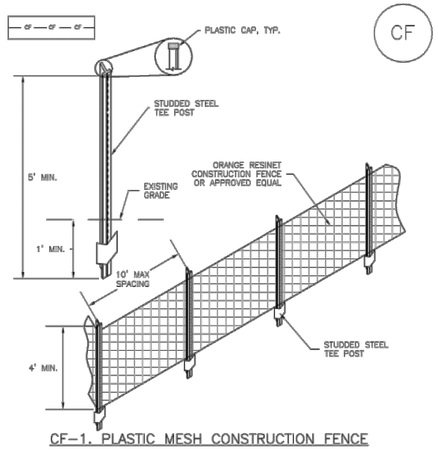


TABLE CB–1. CLASS 1 COMPOST	
PARAMETERS	CHARACTERISTIC
MINIMUM STABILITY INDICATOR	STABLE TO VERY STABLE
SOLUBLE SALTS	MAXIMUM 5 mmhos/cm
PH	6.0 – 8.0
AQ INDEX	> 10
MATURITY INDICATOR EXPRESSED AS PERCENTAGE OF GERMINATION/VIGOR	80+/80+
MATURITY INDICATOR EXPRESSED AS AMMONIA N/ NITRATE N RATIO	< 4
MATURITY INDEX AS CARBON TO NITROGEN RATIO	20:1
TESTED FOR CLOPYRALID	YES/NEGATIVE RESULT
MOISTURE CONTENT	30–60%
ORGANIC MATTER CONTENT	25–45% OF DRY WEIGHT
PARTICLE SIZE DISTRIBUTION	3" (75mm) 100% PASSING
PRIMARY, SECONDARY NUTRIENTS; TRACE ELEMENTS	MUST BE REPORTED
TESTING AND TEST REPORT SUBMITTAL REQUIREMENTS	STA + CLOPYRALID
ORGANIC MATTER PER CUBIC YARD	MUST REPORT
CHEMICAL CONTAMINANTS	COMPLY WITH US EPA CLASS A STANDARD, 40 CFR 503.1 TABLES 1 & 3 LEVELS
MINIMUM MANUFACTURING/PRODUCTION REQUIREMENT	FULLY PERMITTED UNDER COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION
RISK FACTOR RELATING TO PLANT GERMINATION AND HEALTH	LOW

CB–1. COMPOST BLANKET AND COMPOST FILTER BERM



CF–1. PLASTIC MESH CONSTRUCTION FENCE

CONSTRUCTION FENCE INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   –LOCATION OF CONSTRUCTION FENCE.

2. CONSTRUCTION FENCE SHOWN SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

3. CONSTRUCTION FENCE SHALL BE COMPOSED OF ORANGE, CONTRACTOR–GRADE MATERIAL THAT IS AT LEAST 4' HIGH. METAL POSTS SHOULD HAVE A PLASTIC CAP FOR SAFETY.

4. STUDDED STEEL TEE POSTS SHALL BE UTILIZED TO SUPPORT THE CONSTRUCTION FENCE. MAXIMUM SPACING FOR STEEL TEE POSTS SHALL BE 10'.

5. CONSTRUCTION FENCE SHALL BE SECURELY FASTENED TO THE TOP, MIDDLE, AND BOTTOM OF EACH POST.

CONSTRUCTION FENCE MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. CONSTRUCTION FENCE SHALL BE REPAIRED OR REPLACED WHEN THERE ARE SIGNS OF DAMAGE SUCH AS RIPS OR SAGS. CONSTRUCTION FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.

5. WHEN CONSTRUCTION FENCES ARE REMOVED, ALL DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE FENCE SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAIL ADAPTED FROM TOWN OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)

COMPOST FILTER BERM AND COMPOST BLANKET INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   –LOCATION OF COMPOST FILTER BERM(S).
   –LENGTH OF COMPOST FILTER BERM(S).

2. COMPOST BERMS AND BLANKETS MAY BE USED IN PLACE OF STRAW MULCH OR GEOTEXTILE FABRIC IN AREAS WHERE ACCESS TO LANDSCAPING IS DIFFICULT DUE TO LANDSCAPING OR OTHER OBJECTS OR IN AREAS WHERE A SMOOTH TURF GRASS FINISH IS DESIRED.

3. FILTER BERMS SHALL RUN PARALLEL TO THE CONTOUR.

4. FILTER BERMS SHALL BE A MINIMUM OF 1 FEET HIGH AND 2 FEET WIDE.

5. FILTER BERMS SHALL BE APPLIED BY PNEUMATIC BLOWER OR BY HAND.

6. FILTER BERMS SHALL ONLY BE UTILIZED IN AREAS WHERE SHEET FLOW CONDITIONS PREVAIL AND NOT IN AREAS OF CONCENTRATED FLOW.

7. COMPOST BLANKETS SHALL BE APPLIED AT A DEPTH OF 1 –3 INCHES (TYPICALLY 2 INCHES). FOR AREAS WITH EXISTING VEGETATION THAT ARE TO BE SUPPLEMENTED BY COMPOST, A THIN 0.5–INCH LAYER MAY BE USED.

8. SEEDING SHALL BE PERFORMED PRIOR TO THE APPLICATION OF COMPOST. ALTERNATIVELY, SEED MAY BE COMBINED WITH COMPOST AND BLOWN WITH THE PNEUMATIC BLOWER.

9. WHEN TURF GRASS FINISH IS NOT DESIRED, SURFACE ROUGHENING ON SLOPES SHALL TAKE PLACE PRIOR TO COMPOST APPLICATION.

10. COMPOST SHALL BE A CLASS 1 COMPOST AS DEFINED BY TABLE CB–1.

COMPOST FILTER BERM MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. COMPOST BERMS AND BLANKETS SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RILLING IN THE COMPOST SURFACE OCCURS.

(DETAILS ADAPTED FROM ARAPAHOE COUNTY, COLORADO, NOT AVAILABLE IN AUTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

Erosion Control Details 1

Thornburg Pit

DRMS Permit Number: M1983060 — Bennett Creek Ranch LLC

Mine Entry Location: Latitude: — Longitude: —
State: CO County: Adams Nearest Town: Bennett
Section: 24 Township: 3S Range: 63W PM: 6th
Major Watershed: Kiowa Creek
Map Scale: 1" N/A

Map Georeferencing Information: Datum: NAD83 Projection: CO CENTRAL

Survey Source: CO LiDAR
Imagery Source: Google
Survey Date: 2013
Imagery Date: 2024

Drawn by: LLD Date: 8/27/2025
Checked by: BEL Date: 11/24/24
Approved by: BEL Date: 11/24/24

File Name: Thornburg Pit

Lewicki & Associates
3375 West Powers Circle Littleton, CO USA 80123 (303)-346-5196 info@lewicki.biz

Description

Temporary seeding can be used to stabilize disturbed areas that will be inactive for an extended period. Permanent seeding should be used to stabilize areas at final grade that will not be otherwise stabilized. Effective seeding includes preparation of a seedbed, selection of an appropriate seed mixture, proper planting techniques, and protection of the seeded area with mulch, geotextiles, or other appropriate measures.



Photograph TS/PS -1. Equipment used to drill seed. Photo courtesy of Douglas County.

Appropriate Uses

When the soil surface is disturbed and will remain inactive for an extended period (typically 30 days or longer), proactive stabilization measures should be implemented. If the inactive period is short-lived (on the order of two weeks), techniques such as surface roughening may be appropriate. For longer periods of inactivity, temporary seeding and mulching can provide effective erosion control. Permanent seeding should be used on finished areas that have not been otherwise stabilized.

Typically, local governments have their own seed mixes and timelines for seeding. Check jurisdictional requirements for seeding and temporary stabilization.

Design and Installation

Effective seeding requires proper seedbed preparation, selection of an appropriate seed mixture, use of appropriate seeding equipment to ensure proper coverage and density, and protection with mulch or fabric until plants are established.

The USDCM Volume 2 *Revegetation* Chapter contains detailed seed mix, soil preparations, and seeding and mulching recommendations that may be referenced to supplement this Fact Sheet.

Drill seeding is the preferred seeding method. Hydroseeding is not recommended except in areas where steep slopes prevent use of drill seeding equipment, and even in these instances it is preferable to hand seed and mulch. Some jurisdictions do not allow hydroseeding or hydromulching.

Seedbed Preparation

Prior to seeding, ensure that areas to be revegetated have soil conditions capable of supporting vegetation. Overlot grading can result in loss of topsoil, resulting in poor quality subsoils at the ground surface that have low nutrient value, little organic matter content, few soil microorganisms, rooting restrictions, and conditions less conducive to infiltration of precipitation. As a result, it is typically necessary to provide stockpiled topsoil, compost, or other soil amendments and rototill them into the soil to a depth of 6 inches or more.

Temporary and Permanent Seeding	
Functions	
Erosion Control	Yes
Sediment Control	No
Site/Material Management	No

Topsoil should be salvaged during grading operations for use and spread on areas to be revegetated later. Topsoil should be viewed as an important resource to be utilized for vegetation establishment, due to its water-holding capacity, structure, texture, organic matter content, biological activity, and nutrient content. The rooting depth of most native grasses in the semi-arid Denver metropolitan area is 6 to 18 inches. At a minimum, the upper 6 inches of topsoil should be stripped, stockpiled, and ultimately respread across areas that will be revegetated.

Where topsoil is not available, subsoils should be amended to provide an appropriate plant-growth medium. Organic matter, such as well digested compost, can be added to improve soil characteristics conducive to plant growth. Other treatments can be used to adjust soil pH conditions when needed. Soil testing, which is typically inexpensive, should be completed to determine and optimize the types and amounts of amendments that are required.

If the disturbed ground surface is compacted, rip or rototill the surface prior to placing topsoil. If adding compost to the existing soil surface, rototilling is necessary. Surface roughening will assist in placement of a stable topsoil layer on steeper slopes, and allow infiltration and root penetration to greater depth.

Prior to seeding, the soil surface should be rough and the seedbed should be firm, but neither too loose nor compacted. The upper layer of soil should be in a condition suitable for seeding at the proper depth and conducive to plant growth. Seed-to-soil contact is the key to good germination.

Seed Mix for Temporary Vegetation

To provide temporary vegetative cover on disturbed areas which will not be paved, built upon, or fully landscaped or worked for an extended period (typically 30 days or more), plant an annual grass appropriate for the time of planting and mulch the planted areas. Annual grasses suitable for the Denver metropolitan area are listed in Table TS/PS-1. These are to be considered only as general recommendations when specific design guidance for a particular site is not available. Local governments typically specify seed mixes appropriate for their jurisdiction.

Seed Mix for Permanent Revegetation

To provide vegetative cover on disturbed areas that have reached final grade, a perennial grass mix should be established. Permanent seeding should be performed promptly (typically within 14 days) after reaching final grade. Each site will have different characteristics and a landscape professional or the local jurisdiction should be contacted to determine the most suitable seed mix for a specific site. In lieu of a specific recommendation, one of the perennial grass mixes appropriate for site conditions and growth season listed in Table TS/PS-2 can be used. The pure live seed (PLS) rates of application recommended in these tables are considered to be absolute minimum rates for seed applied using proper drill-seeding equipment.

If desired for wildlife habitat or landscape diversity, shrubs such as rubber rabbitbrush (*Chrysothamnus nauseosus*), fourwing saltbush (*Atriplex canescens*) and skunkbrush sumac (*Rhus trilobata*) could be added to the upland seedmixes at 0.25, 0.5 and 1 pound PLS/acre, respectively. In riparian zones, planting root stock of such species as American plum (*Prunus americana*), woods rose (*Rosa woodsii*), plains cottonwood (*Populus sargentii*), and willow (*Populus spp.*) may be considered. On non-topsoiled upland sites, a legume such as Ladak alfalfa at 1 pound PLS/acre can be included as a source of nitrogen for perennial grasses.

Seeding dates for the highest success probability of perennial species along the Front Range are generally in the spring from April through early May and in the fall after the first of September until the ground freezes. If the area is irrigated, seeding may occur in summer months, as well. See Table TS/PS-3 for appropriate seeding dates.

Table TS/PS-1. Minimum Drill Seeding Rates for Various Temporary Annual Grasses

Species[a] (Common name)	Growth Season[b]	Pounds of Pure Live Seed (PLS)/acre[c]	Planting Depth (inches)
1. Oats	Cool	35 - 50	1 - 2
2. Spring wheat	Cool	25 - 35	1 - 2
3. Spring barley	Cool	25 - 35	1 - 2
4. Annual ryegrass	Cool	10 - 15	½
5. Millet	Warm	3 - 15	½ - ¾
6. Sudangrass	Warm	5–10	½ - ¾
7. Sorghum	Warm	5–10	½ - ¾
8. Winter wheat	Cool	20–35	1 - 2
9. Winter barley	Cool	20–35	1 - 2
10. Winter rye	Cool	20–35	1 - 2
11. Triticale	Cool	25–40	1 - 2

[a] Successful seeding of annual grass resulting in adequate plant growth will usually produce enough dead-plant residue to provide protection from wind and water erosion for an additional year. This assumes that the cover is not disturbed or mowed closer than 8 inches.

Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1 or where access limitations exist. When hydraulic seeding is used, hydraulic mulching should be applied as a separate operation, when practical, to prevent the seeds from being encapsulated in the mulch.

[b] See Table TS/PS-3 for seeding dates. Irrigation, if consistently applied, may extend the use of cool season species during the summer months.

[c] Seeding rates should be doubled if seed is broadcast, or increased by 50 percent if done using a Brillion Drill or by hydraulic seeding.

Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses

Common[a] Name	Botanical Name	Growth Season[b]	Growth Form	Seeds/ Pound	Pounds of PLS/acre
Alakali Soil Seed Mix					
Alkali sacaton	*Sporobolus airoides*	Cool	Bunch	1,750,000	0.25
Basin wildrye	*Elymus cinereus*	Cool	Bunch	165,000	2.5
Sodar streambank wheatgrass	*Agropyron riparium 'Sodar'*	Cool	Sod	170,000	2.5
Jose tall wheatgrass	*Agropyron elongatum 'Jose'*	Cool	Bunch	79,000	7.0
Arriba western wheatgrass	*Agropyron smithii 'Arriba'*	Cool	Sod	110,000	5.5
Total					**17.75**
Fertile Loamy Soil Seed Mix					
Ephriam crested wheatgrass	*Agropyron cristatum 'Ephriam'*	Cool	Sod	175,000	2.0
Dural hard fescue	*Festuca ovina 'duriuscula'*	Cool	Bunch	565,000	1.0
Lincoln smooth brome	*Bromus inermis leyss 'Lincoln'*	Cool	Sod	130,000	3.0
Sodar streambank wheatgrass	*Agropyron riparium 'Sodar'*	Cool	Sod	170,000	2.5
Arriba western wheatgrass	*Agropyron smithii 'Arriba'*	Cool	Sod	110,000	7.0
Total					**15.5**
High Water Table Soil Seed Mix					
Meadow foxtail	*Alopecurus pratensis*	Cool	Sod	900,000	0.5
Redtop	*Agrostis alba*	Warm	Open sod	5,000,000	0.25
Reed canarygrass	*Phalaris arundinacea*	Cool	Sod	68,000	0.5
Lincoln smooth brome	*Bromus inermis leyss 'Lincoln'*	Cool	Sod	130,000	3.0
Pathfinder switchgrass	*Panicum virgatum 'Pathfinder'*	Warm	Sod	389,000	1.0
Alkar tall wheatgrass	*Agropyron elongatum 'Alkar'*	Cool	Bunch	79,000	5.5
Total					**10.75**
Transition Turf Seed Mix[c]					
Ruebens Canadian bluegrass	*Poa compressa 'Ruebens'*	Cool	Sod	2,500,000	0.5
Dural hard fescue	*Festuca ovina 'duriuscula'*	Cool	Bunch	565,000	1.0
Citation perennial ryegrass	*Lolium perenne 'Citation'*	Cool	Sod	247,000	3.0
Lincoln smooth brome	*Bromus inermis leyss 'Lincoln'*	Cool	Sod	130,000	3.0
Total					**7.5**

Table TS/PS-2. Minimum Drill Seeding Rates for Perennial Grasses (cont.)

Common Name	Botanical Name	Growth Season[b]	Growth Form	Seeds/ Pound	Pounds of PLS/acre
Sandy Soil Seed Mix					
Blue grama	*Bouteloua gracilis*	Warm	Sod-forming bunchgrass	825,000	0.5
Camper little bluestem	*Schizachyrium scoparium 'Camper'*	Warm	Bunch	240,000	1.0
Prairie sandreed	*Calamovilfa longifolia*	Warm	Open sod	274,000	1.0
Sand dropseed	*Sporobolus cryptandrus*	Cool	Bunch	5,298,000	0.25
Vaughn sideoats grama	*Bouteloua curtipendula 'Vaughn'*	Warm	Sod	191,000	2.0
Arriba western wheatgrass	*Agropyron smithii 'Arriba'*	Cool	Sod	110,000	5.5
Total					**10.25**
Heavy Clay, Rocky Foothill Seed Mix					
Ephriam crested wheatgrass[d]	*Agropyron cristatum 'Ephriam'*	Cool	Sod	175,000	1.5
Oahe Intermediate wheatgrass	*Agropyron intermedium 'Oahe'*	Cool	Sod	115,000	5.5
Vaughn sideoats grama[e]	*Bouteloua curtipendula 'Vaughn'*	Warm	Sod	191,000	2.0
Lincoln smooth brome	*Bromus inermis leyss 'Lincoln'*	Cool	Sod	130,000	3.0
Arriba western wheatgrass	*Agropyron smithii 'Arriba'*	Cool	Sod	110,000	5.5
Total					**17.5**

[a] All of the above seeding mixes and rates are based on drill seeding followed by crimped straw mulch. These rates should be doubled if seed is broadcast and should be increased by 50 percent if the seeding is done using a Brillion Drill or is applied through hydraulic seeding. Hydraulic seeding may be substituted for drilling only where slopes are steeper than 3:1. If hydraulic seeding is used, hydraulic mulching should be done as a separate operation.

[b] See Table TS/PS-3 for seeding dates.

[c] If site is to be irrigated, the transition turf seed rates should be doubled.

[d] Crested wheatgrass should not be used on slopes steeper than 6H to 1V.

[e] Can substitute 0.5 lbs PLS of blue grama for the 2.0 lbs PLS of Vaughn sideoats grama.

Table TS/PS-3. Seeding Dates for Annual and Perennial Grasses

	Annual Grasses (Numbers in table reference species in Table TS/PS-1)		Perennial Grasses	
Seeding Dates	**Warm**	**Cool**	**Warm**	**Cool**
January 1–March 15			✓	✓
March 16–April 30	4	1,2,3	✓	✓
May 1–May 15	4		✓	
May 16–June 30	4,5,6,7			
July 1–July 15	5,6,7			
July 16–August 31				
September 1–September 30		8,9,10,11		
October 1–December 31			✓	✓

Mulch

Cover seeded areas with mulch or an appropriate rolled erosion control product to promote establishment of vegetation. Anchor mulch by crimping, netting or use of a non-toxic tackifier. See the Mulching BMP Fact Sheet for additional guidance.

Maintenance and Removal

Monitor and observe seeded areas to identify areas of poor growth or areas that fail to germinate. Reseed and mulch these areas, as needed.

An area that has been permanently seeded should have a good stand of vegetation within one growing season if irrigated and within three growing seasons without irrigation in Colorado. Reseed portions of the site that fail to germinate or remain bare after the first growing season.

Seeded areas may require irrigation, particularly during extended dry periods. Targeted weed control may also be necessary.

Protect seeded areas from construction equipment and vehicle access.

Erosion Control Details 2

Thornburg Pit

DRMS Permit Number: M1983060 — Bennett Creek Ranch LLC

Mine Entry Location: Latitude: ---- Longitude: ----
State: CO County: Adams Nearest Town: Bennett
Section: 24 Township: 3S Range: 63W PM: 6th
Major Watershed: Kiowa Creek
Map Scale: 1": N/A

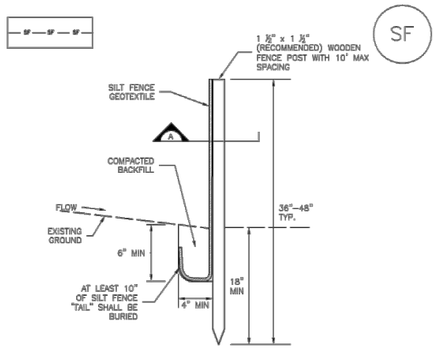
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Imagery Source: Google
Survey Date: 2013
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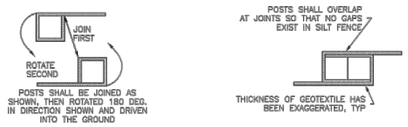
Drawn by: LLD — Date: 8/27/2025
Checked by: BEL — Date: 11/24/24
Approved by: BEL — Date: 11/24/24

File Name: Thornburg Pit

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SILT FENCE



SECTION A

SF–1. SILT FENCE

SILT FENCE INSTALLATION NOTES

1. SILT FENCE MUST BE PLACED AWAY FROM THE TOE OF THE SLOPE TO ALLOW FOR WATER PONDING. SILT FENCE AT THE TOE OF A SLOPE SHOULD BE INSTALLED IN A FLAT LOCATION AT LEAST SEVERAL FEET (2–5 FT) FROM THE TOE OF THE SLOPE TO ALLOW ROOM FOR PONDING AND DEPOSITION.

2. A UNIFORM 6" X 4" ANCHOR TRENCH SHALL BE EXCAVATED USING TRENCHER OR SILT FENCE INSTALLATION DEVICE. NO ROAD GRADERS, BACKHOES, OR SIMILAR EQUIPMENT SHALL BE USED.

3. COMPACT ANCHOR TRENCH BY HAND WITH A "JUMPING JACK" OR BY WHEEL ROLLING. COMPACTION SHALL BE SUCH THAT SILT FENCE RESISTS BEING PULLED OUT OF ANCHOR TRENCH BY HAND.

4. SILT FENCE SHALL BE PULLED TIGHT AS IT IS ANCHORED TO THE STAKES. THERE SHOULD BE NO NOTICEABLE SAG BETWEEN STAKES AFTER IT HAS BEEN ANCHORED TO THE STAKES.

5. SILT FENCE FABRIC SHALL BE ANCHORED TO THE STAKES USING 1" HEAVY DUTY STAPLES OR NAILS WITH 1" HEADS. STAPLES AND NAILS SHOULD BE PLACED 3" ALONG THE FABRIC DOWN THE STAKE.

6. AT THE END OF A RUN OF SILT FENCE ALONG A CONTOUR, THE SILT FENCE SHOULD BE TURNED PERPENDICULAR TO THE CONTOUR TO CREATE A "J–HOOK." THE "J–HOOK" EXTENDING PERPENDICULAR TO THE CONTOUR SHOULD BE OF SUFFICIENT LENGTH TO KEEP RUNOFF FROM FLOWING AROUND THE END OF THE SILT FENCE (TYPICALLY 10' – 20').

7. SILT FENCE SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

SILT FENCE MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. SEDIMENT ACCUMULATED UPSTREAM OF THE SILT FENCE SHALL BE REMOVED AS NEEDED TO MAINTAIN THE FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY 6".

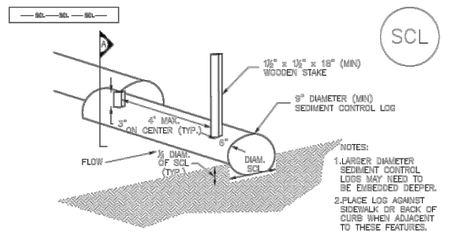
5. REPAIR OR REPLACE SILT FENCE WHEN THERE ARE SIGNS OF WEAR, SUCH AS SAGGING, TEARING, OR COLLAPSE.

6. SILT FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION, OR IS REPLACED BY AN EQUIVALENT PERIMETER SEDIMENT CONTROL BMP.

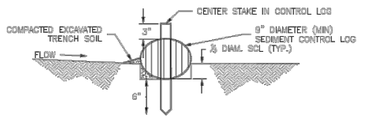
7. WHEN SILT FENCE IS REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

(DETAIL ADAPTED FROM TOWN OF PARKER, COLORADO AND CITY OF AURORA, NOT AVAILABLE IN AUTOCAD)

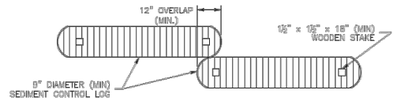
NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.



TRENCHED SEDIMENT CONTROL LOG

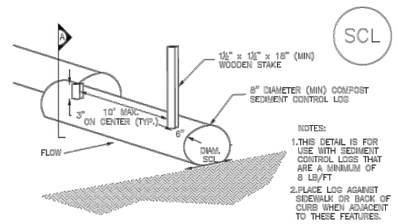


SECTION (A)
TRENCHED SEDIMENT CONTROL LOG

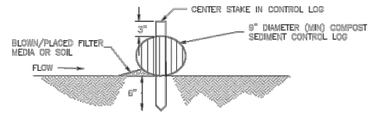


LOG JOINTS

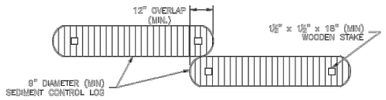
SCL–1. TRENCHED SEDIMENT CONTROL LOG



COMPOST SEDIMENT CONTROL LOG (WEIGHTED)

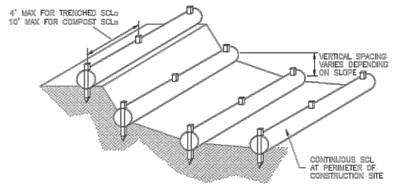


SECTION (A)
COMPOST SEDIMENT CONTROL LOG



LOG JOINTS

SCL–2. COMPOST SEDIMENT CONTROL LOG (WEIGHTED)



SCL–3. SEDIMENT CONTROL LOGS TO CONTROL SLOPE LENGTH

SEDIMENT CONTROL LOG INSTALLATION NOTES

1. SEE PLAN VIEW FOR LOCATION AND LENGTH OF SEDIMENT CONTROL LOGS.

2. SEDIMENT CONTROL LOGS THAT ACT AS A PERIMETER CONTROL SHALL BE INSTALLED PRIOR TO ANY UPGRADIENT LAND–DISTURBING ACTIVITIES.

3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR OR COCONUT FIBER, AND SHALL BE FREE OF ANY NOXIOUS WEED SEEDS OR DEFECTS INCLUDING RIPS, HOLES AND OBVIOUS WEAR.

4. SEDIMENT CONTROL LOGS MAY BE USED AS SMALL CHECK DAMS IN DITCHES AND SWALES. HOWEVER, THEY SHOULD NOT BE USED IN PERENNIAL STREAMS.

5. IT IS RECOMMENDED THAT SEDIMENT CONTROL LOGS BE TRENCHED INTO THE GROUND TO A DEPTH OF APPROXIMATELY ⅓ OF THE DIAMETER OF THE LOG. IF TRENCHING TO THIS DEPTH IS NOT FEASIBLE AND/OR DESIRABLE (SHORT TERM INSTALLATION WITH DESIRE NOT TO DAMAGE LANDSCAPE) A LESSER TRENCHING DEPTH MAY BE ACCEPTABLE WITH MORE ROBUST STAKING. COMPOST LOGS THAT ARE 8 LB/FT DO NOT NEED TO BE TRENCHED.

6. THE UPHILL SIDE OF THE SEDIMENT CONTROL LOG SHALL BE BACKFILLED WITH SOIL OR FILTER MATERIAL THAT IS FREE OF ROCKS AND DEBRIS. THE SOIL SHALL BE TIGHTLY COMPACTED INTO THE SHAPE OF A RIGHT TRIANGLE USING A SHOVEL OR WEIGHTED LAWN ROLLER OR BLOWN IN PLACE.

7. FOLLOW MANUFACTURERS' GUIDANCE FOR STAKING. IF MANUFACTURERS' INSTRUCTIONS DO NOT SPECIFY SPACING, STAKES SHALL BE PLACED ON 4' CENTERS AND EMBEDDED A MINIMUM OF 6" INTO THE GROUND. 3" OF THE STAKE SHALL PROTRUDE FROM THE TOP OF THE LOG. STAKES THAT ARE BROKEN PRIOR TO INSTALLATION SHALL BE REPLACED. COMPOST LOGS SHOULD BE STAKED 10' ON CENTER.

SEDIMENT CONTROL LOG MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOG SHALL BE REMOVED AS NEEDED TO MAINTAIN FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY ½ OF THE HEIGHT OF THE SEDIMENT CONTROL LOG.

5. SEDIMENT CONTROL LOG SHALL BE REMOVED AT THE END OF CONSTRUCTION.COMPOST FROM COMPOST LOGS MAY BE LEFT IN PLACE AS LONG AS BAGS ARE REMOVED AND THE AREA SEEDED. IF DISTURBED AREAS EXIST AFTER REMOVAL, THEY SHALL BE COVERED WITH TOP SOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

(DETAILS ADAPTED FROM TOWN OF PARKER, COLORADO, JEFFERSON COUNTY, COLORADO, DOUGLAS COUNTY, COLORADO, AND CITY OF AURORA, COLORADO, NOT AVAILABLE IN AUTOCAD)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

Erosion Control Details 3

Thornburg Pit

DRMS Permit Number: M1983060 — Bennett Creek Ranch LLC

Mine Entry Location: Latitude: ---- Longitude: ----
State: CO County: Adams Nearest Town: Bennett
Section: 24 Township: 3S Range: 63W PM: 6th
Major Watershed: Kiowa Creek
Map Scale: 1"=N/A

Map Georeferencing Information: Datum: NAD83 Projection: CO CENTRAL

Survey Source: CO LIDAR
Imagery Source: Google
Survey Date: 2013
Imagery Date: 2024

Drawn by: LLD Date: 8/27/2025
Checked by: BEL Date: 11/24/24
Approved by: BEL Date: 11/24/24

File Name: Thornburg Pit

Lewicki & Associates
3375 West Powers Circle Littleton, CO USA 80123 (303)-346-5196 info@lewicki.biz

ADAMS COUNTY EROSION CONTROL PLAN - GENERAL NOTES:

1. ALL CONSTRUCTION PROJECTS, REGARDLESS OF THE SIZE, SHALL INSTALL, MAINTAIN AND REPAIR STORMWATER POLLUTION CONTROL MEASURES (CMS) TO EFFECTIVELY MINIMIZE EROSION, SEDIMENT TRANSPORT, AND THE RELEASE OF POLLUTANTS RELATED TO CONSTRUCTION ACTIVITY. CMS EXAMPLE INCLUDE SEDIMENT CONTROL LOGS (SCL), SILT FENCE (SF), DIKES/SWALES, SEDIMENT TRAPS (ST), INLET PROTECTION (IP), OUTLET PROTECTION (OP), CHECK DAMS (CD), SEDIMENT BASINS (SB), TEMPORARY/PERMANENT SEEDING AND MULCHING (MU), SOIL ROUGHENING, MAINTAINING EXISTING VEGETATION AND PROTECTION OF TREES. CMS MUST BE SELECTED, DESIGNED, ADEQUATELY SIZED, INSTALLED AND MAINTAINED IN ACCORDANCE WITH GOOD ENGINEERING, HYDROLOGIC AND POLLUTION CONTROL PRACTICES. CMS/BMPS INSTALLATION AND MAINTENANCE DETAILS SHALL CONFORM TO MILE HIGH FLOOD DISTRICT'S URBAN DRAINAGE FLOOD CONTROL CRITERIA MANUAL VOLUME 3, OR THE COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) STANDARDS & SPECIFICATIONS (GREEN BOOK). CMS MUST FILTER, SETTLE, CONTAIN OR STRAIN POLLUTANTS FROM STORMWATER FLOWS IN ORDER TO PREVENT BYPASS OF FLOWS WITHOUT TREATMENT. CMS MUST BE APPROPRIATE TO TREAT THE RUNOFF FROM THE AMOUNT OF DISTURBED AREA, THE EXPECTED FLOW RATE, DURATION, AND FLOW CONDITIONS (I.E., SHEET OR CONCENTRATED FLOW). CMS/BMPS SHALL BE SPECIFIED IN THE SWMP (IF APPLICABLE), AND THE LOCATIONS SHOWN ON THE EC PLAN.

2. PRIOR TO CONSTRUCTION, PROJECTS DISTURBING 1 OR MORE ACRES OF LAND, OR ANY PROJECT BELONGING TO A COMMON PLAN OF DEVELOPMENT DISTURB 1 OR MORE ACRES, MUST OBTAIN:
   - A GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES, FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, AND
   - AN ADAMS COUNTY STORMWATER QUALITY PERMIT WITHIN THE UNINCORPORATED ADAMS COUNTY MS4 AREA.

3. PERMITTED PROJECTS SHALL DEVELOP A STORMWATER MANAGEMENT PLAN (SWMP), AKA EROSION AND SEDIMENT CONTROL PLAN IN COMPLIANCE WITH CDPHE MINIMUM REQUIREMENTS. THE APPROVED SWMP, INCLUDING EROSION CONTROL (EC) PLAN (SITE MAP), SHALL BE KEPT ON SITE AND ALWAYS UPDATED. THE QUALIFIED STORMWATER MANAGER IS RESPONSIBLE FOR IMPLEMENTING THE SWMP AND CMS (AKA BMPS) DURING CONSTRUCTION.

4. PERMITTED PROJECTS SHALL PERFORM REGULAR STORMWATER INSPECTIONS EVERY 7 CALENDAR DAYS; OR EVERY 14 CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY PRECIPITATION OR SNOWMELT EVENT THAT CAUSES SURFACE EROSION. INSPECTION FREQUENCY CAN BE REDUCED FOR POST-STORM EVENT INSPECTIONS AT TEMPORARILY IDLE SITES AND FOR STORMWATER INSPECTIONS AT COMPLETED SITES WAITING FOR FINAL STABILIZATION. INSPECTION REPORTS MUST IDENTIFY ANY INCIDENTS OF NON-COMPLIANCE.

5. TRACKING OF DIRT ONTO PAVED PUBLIC OR PRIVATE PAVED ROADS IS NOT ALLOWED. THE USE OF DIRT RAMPS TO ENTER/EXIT FROM AN UNPAVED INTO A PAVED AREA IS PROHIBITED. VEHICLE TRACKING CONTROLS SHALL BE IMPLEMENTED, OTHERWISE ENTRANCE AREA MUST DRAIN THRU A CM TOWARDS THE PRIVATE SITE.

6. TRUCKLOADS OF FILL MATERIAL IMPORTED TO OR CUT MATERIAL EXPORTED FROM THE SITE SHALL BE PROPERLY COVERED TO PREVENT LOSS OF THE MATERIAL DURING TRANSPORTATION ON PUBLIC ROW. HAUL ROUTES MUST BE PERMITTED BY THE COUNTY. NO MATERIAL SHALL BE TRANSPORTED TO ANOTHER SITE WITHOUT APPLICABLE PERMITS.

7. CONTROL MEASURES DESIGNED FOR CONCRETE WASHOUT WASTE MUST BE IMPLEMENTED. THIS INCLUDES WASHOUT WASTE DISCHARGED TO THE GROUND AND WASHOUT WASTE FROM CONCRETE TRUCKS AND MASONRY OPERATIONS.

8. TEMPORARY CMS/BMPS SHALL BE REMOVED AFTER THE SITE HAS REACHED FINAL STABILIZATION.

9. DEWATERING OPERATIONS DISCHARGING OFF-SITE INTO ANY WATERS CONVEYANCE SYSTEMS INCLUDING WETLANDS, IRRIGATION DITCHES, CANALS, RIVERS, STREAMS OR STORM SEWER SYSTEMS, REQUIRE A STATE CONSTRUCTION DEWATERING PERMIT.

10. PERMITTED PROJECTS SHALL KEEP THE CDPHE'S STORMWATER DISCHARGE PERMIT, STORMWATER MANAGEMENT PLAN (SWMP) AND INSPECTION LOGS AVAILABLE ON-SITE THROUGHOUT THE DURATION OF THE PROJECT, AND FOR AN ADDITIONAL 3 YEARS AFTER PERMIT CLOSE-OUT.

11. PERMITTED LANDOWNER AND/OR CONTRACTOR SHALL CLOSE THE STATE AND CITY/COUNTY PERMIT ONCE FINAL STABILIZATION IS REACHED. STORMWATER INSPECTIONS SHALL CONTINUE UNTIL INACTIVATION NOTICE IS FILED WITH CDPHE.

PERFORMANCE STANDARD NOTES:

1. STORMWATER RUNOFF FROM DISTURBED AREAS MUST FLOW TO AT LEAST ONE (1) CM TO MINIMIZE SEDIMENT IN THE DISCHARGE DO NOT ALLOW SEDIMENT TO LEAVE THE SITE. THE BEST WAY TO PREVENT SEDIMENT OR POLLUTANTS FROM ENTERING THE STORM SEWER SYSTEM IS TO STABILIZE THE SITE AS QUICKLY AS POSSIBLE, PREVENTING EROSION AND STOPPING SEDIMENT RUN-OFF AT ITS

2. PHASE CONSTRUCTION TO MINIMIZE DISTURBED AREAS, INCLUDING DISTURBANCE OF STEEP SLOPES. (I.E., THE ENTIRE PROJECT SITE SHOULD NOT BE DISTURBED IF CONSTRUCTION WILL ONLY BE OCCURRING IN ONE SECTION OF THE SITE). LIMIT SOIL EXPOSURE TO THE SHORTEST POSSIBLE PERIOD OF TIME. PROTECT NATURAL FEATURES AND EXISTING VEGETATION WHENEVER POSSIBLE. REMOVAL OF EXISTING VEGETATION SHALL BE LIMITED TO THE AREA REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATIONS. MAINTAIN PRE-EXISTING VEGETATION (OR EQUIVALENT CMS) FOR AREAS WITHIN 50 HORIZONTAL FT OF RECEIVING WATERS.

3. SOIL COMPACTION MUST BE MINIMIZED FOR AREAS WHERE INFILTRATION CMS WILL OCCUR OR WHERE FINAL STABILIZATION WILL BE ACHIEVED THROUGH VEGETATIVE COVER.

4. ALL SOIL IMPORTED TO OR EXPORTED FROM THE SITE SHALL BE PROPERLY COVERED TO PREVENT THE LOSS OF MATERIAL DURING TRANSPORT.

5. DUST EMISSIONS RESULTING FROM GRADING ACTIVITIES OR WIND SHALL BE CONTROLLED.

6. INSTALL CONSTRUCTION FENCE (ORANGE) TO PROTECT WETLANDS AND OTHER SENSITIVE AREAS AND TO PREVENT ACCESS, AND TO DELINEATE THE LIMITS OF CONSTRUCTION. DO NOT USE SILT FENCE TO PROTECT WETLANDS SINCE TRENCHING MAY IMPACT THESE AREAS.

7. CMS INTENDED TO CAPTURE OVERLAND, LOW VELOCITY SHEET FLOW AT A LEVEL GRADE SHALL ONLY BE INSTALLED ALONG CONTOURS.

8. INSTALL CMS, SUCH AS CHECK DAMS, PERPENDICULAR TO THE CONCENTRATED FLOWS TO REDUCE FLOW VELOCITY.

9. STORM DRAIN INLETS WITHIN AND ADJACENT TO THE CONSTRUCTION SITE MUST BE PROTECTED. ANY PONDING OF STORMWATER AROUND INLET PROTECTION MUST NOT CAUSE EXCESSIVE FLOODING OR DAMAGE ADJACENT AREAS OR STRUCTURES.

10. INSTALL VEHICLE TRACKING CONTROL (VTC) TO ENTER/EXIT UNPAVED AREA. DO NOT USE RECYCLED CRUSHED CONCRETE OR ASPHALT MILLINGS FOR VEHICLE TRACKING PADS.

11. STRAW BALES SHALL NOT BE USED FOR PRIMARY EROSION OR SEDIMENT CONTROL (I.E., STRAW BALES MAY BE USED FOR REINFORCEMENT BEHIND ANOTHER BMP SUCH AS SILT FENCE).

12. OUTLETS SYSTEMS (SUCH AS SKIMMER OR PERFORATED RISER PIPE) SHALL BE INSTALLED TO WITHDRAW WATER FROM OR NEAR THE SURFACE LEVEL WHEN DISCHARGING FROM BASINS. WATER CANNOT DRAIN FROM THE BOTTOM OF THE POND.
    TEMPORARY STABILIZATION MUST BE IMPLEMENTED FOR EARTH DISTURBING ACTIVITIES ON ANY PORTION OF THE SITE WHERE LAND DISTURBING ACTIVITIES HAVE PERMANENTLY OR TEMPORARILY CEASED (FOR MORE THAN 14 CALENDAR DAYS). TEMPORARY STABILIZATION METHODS EXAMPLES: TARPS, SOIL TACKIFIER, AND HYDROSEED. TEMPORARY STABILIZATION REQUIREMENT MAY EXCEED THE 14-DAY SCHEDULE WHEN EITHER THE FUNCTION OF THE SPECIFIC AREA REQUIRES IT TO REMAIN DISTURBED, OR PHYSICAL CHARACTERISTICS OF THE TERRAIN AND CLIMATE PREVENT STABILIZATION AS LONG AS THE CONSTRAINTS AND ALTERNATIVE SCHEDULE IS DOCUMENTED ON THE SWMP, AND LOCATIONS ARE IDENTIFIED ON THE EC PLAN (SITE MAP).

13. RUNOFF FROM STOCKPILE AREA MUST BE CONTROLLED. SOILS THAT WILL BE STOCKPILED FOR MORE THAN 30 DAYS SHALL BE PROTECTED FROM WIND AND WATER EROSION WITHIN 14 DAYS OF STOCKPILE CONSTRUCTION. INSTALL CMS/BMPS 5 FT AWAY FROM THE TOE OF THE STOCKPILE'S SLOPE.

14. WATER USE TO CLEAN CONCRETE TRUCKS SHALL BE DISCHARGED INTO A CONCRETE WASHOUT AREA (CWA). THE PREDEFINED CONTAINMENT AREA MUST BE IDENTIFIED WITH A SIGN AND SHALL ALLOW THE LIQUIDS TO EVAPORATE OR DRY OUT. CWA DISCHARGES THAT MAY REACH GROUNDWATER MUST FLOW THROUGH SOIL THAT HAS BUFFERING CAPACITY PRIOR TO REACHING GROUNDWATER. THE CONCRETE WASHOUT LOCATION SHALL NOT BE IN AN AREA WHERE SHALLOW GROUNDWATER MAY BE PRESENT AND WOULD RESULT IN BUFFERING CAPACITY NOT BEING ADEQUATE, SUCH AS NEAR NATURAL DRAINAGES, SPRINGS, OR WETLANDS. IN THIS CASE, A LINER UNDERNEATH IS NEEDED FOR AREAS WITH HIGH GROUNDWATER LEVELS. CWA SHALL NOT BE PLACED IN LOW AREAS, DITCHES OR ADJACENT TO STATE WATERS. PLACE CWA 50 FT AWAY FROM STATE WATERS.

15. WASTE, SUCH AS BUILDING MATERIALS, WORKERS TRASH AND CONSTRUCTION DEBRIS, MUST BE PROPERLY MANAGED TO PREVENT STORMWATER POLLUTION.

16. INSTALL STABILIZED STAGING AREA (SSA) TO STORE MATERIALS, CONSTRUCTION TRAILER, ETC.

17. IF CONDITIONS IN THE FIELD WARRANT ADDITIONAL CMS/BMPS TO THE ONES ORIGINALLY APPROVED ON THE SWMP OR EC PLAN (CIVIL DRAWING), THE LANDOWNER OR CONTRACTOR SHALL IMPLEMENT MEASURES DETERMINED NECESSARY, AS DIRECTED BY THE PERMANENT CMS/BMPS FOR SLOPES, CHANNELS, DITCHES, OR DISTURBED LAND AREA SHALL BE PERFORMED IMMEDIATELY AFTER FINAL GRADING. CONSIDER THE USE EROSION CONTROL BLANKETS ON SLOPES 3:1 OR STEEPER AND AREAS WITH CONCENTRATED FLOWS SUCH AS SWALES, LONG CHANNELS AND ROADSIDE DITCHES.

18. THE DISCHARGE OF SANITARY WASTE INTO THE STORM SEWER SYSTEM IS PROHIBITED. PORTABLE TOILETS MUST BE PROVIDED, SECURED AND PLACED ON PERMEABLE SURFACES, AWAY FROM THE CURBSIDE, STORM INLETS AND/OR DRAINAGE WAYS.

19. REMOVE TEMPORARY CMS/BMPS ONCE FINAL STABILIZATION IS REACHED, UNLESS OTHERWISE AUTHORIZED.

20. FINAL STABILIZATION MUST BE IMPLEMENTED. FINAL STABILIZATION IS REACHED WHEN ALL SOIL DISTURBING ACTIVITIES HAVE BEEN COMPLETED, AND EITHER A UNIFORM VEGETATIVE COVER HAS BEEN ESTABLISHED WITH AN INDIVIDUAL PLANT DENSITY OF AT LEAST 70% OF PRE-DISTURBANCE LEVELS, OR EQUIVALENT PERMANENT ALTERNATIVE METHOD HAS BEEN IMPLEMENTED.

21. PROVIDE SPILL PREVENTION AND CONTAINMENT MEASURES FOR CONSTRUCTION MATERIALS, WASTE AND FUEL STORAGE AREAS. BULK STORAGE (55 GALLONS OR GREATER) OF PETROLEUM PRODUCTS AND LIQUID CHEMICALS MUST HAVE SECONDARY CONTAINMENT, OR EQUIVALENT PROTECTION, IN ORDER TO CONTAIN SPILLS AND TO PREVENT SPILLED MATERIAL FROM ENTERING STATE WATERS.

22. RT SPILLS OR RELEASES OF CHEMICAL, OIL, PETROLEUM PRODUCT, SEWAGE, ETC., WHICH MAY REACH THE STORM SEWER OR ENTER STATE WATERS WITHIN 24-HOURS FROM TIME OF DISCOVERY. GUIDANCE AVAILABLE AT HTTPS://CDPHE.COLORADO.GOV/REPORT-CONCERN-EMERGENCY STATE OF COLORADO SPILL-LINE: 1-877-518-5608. ADAMS COUNTY STORMWATER HOTLINE: SWQ@ADCOGOV.ORG; PUBLIC WORKS 720-523-6875 OR PUBLICWORKS@ADCOGOV.ORG AND ADAMS COUNTY PUBLIC HEALTH DEPARTMENT AT 303-288-6816

MAINTENANCE STANDARD NOTES:

1. MAINTAIN AND REPAIR CMS ACCORDING TO APPROVED EROSION CONTROL PLAN (CIVIL DRAWING) TO ASSURE THEY CONTINUE PERFORMING AS ORIGINALLY INTENDED.

2. CMS/BMPS REQUIRING MAINTENANCE OR ADJUSTMENT SHALL BE REPAIRED IMMEDIATELY AFTER OBSERVATION OF THE FAILING BMP.

3. CMS SHALL BE CLEANED WHEN SEDIMENT LEVELS ACCUMULATE TO HALF THE DESIGN UNLESS OTHERWISE SPECIFIED.

4. SWMP AND EC PLAN SHALL BE CONTINUOUSLY UPDATED TO REFLECT NEW OR REVISED CMS/BMPS DUE TO CHANGES IN DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE, TO ACCURATELY REFLECT THE ACTUAL FIELD CONDITIONS. A NOTATION SHALL BE MADE IN THE SWMP, INCLUDING DATE OF CHANGES IN THE FIELD, IDENTIFICATION OF THE CMS REMOVED, MODIFIED OR ADDED, AND THE LOCATIONS OF THOSE CMS. UPDATES MUST BE MADE WITHIN 72-HOURS FOLLOWING THE CHANGE.

5. MAINTAIN VEHICLE TRACKING CONTROL (VTC), IF SEDIMENT TRACKING OCCURS, CLEAN-UP IMMEDIATELY. SWEEP BY HAND OR THE USE STREET SWEEPERS (WITH VACUUM SYSTEM). FLUSHING OFF PAVED SURFACES WITH WATER IS PROHIBITED.

6. CWA MUST BE CLEANED ONCE WASTE ACCUMULATION REACHES ⅔ OF THE WET STORAGE CAPACITY OF THE STRUCTURE. LEGALLY DISPOSED OF CONCRETE WASTE. DO NOT BURY ON-SITE.

7. CLEAN-UP SPILLS IMMEDIATELY AFTER DISCOVERY OR CONTAIN UNTIL APPROPRIATE CLEANUP METHODS CAN BE EMPLOYED. FOLLOW MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEANUP, ALONG WITH PROPER DISPOSAL METHODS. RECORDS OF SPILLS, LEAKS, OR OVERFLOWS THAT RESULT IN DISCHARGE OF POLLUTANTS MUST BE DOCUMENTED AND MAINTAINED.

8. REMOVE SEDIMENT FROM STORM SEWER INFRASTRUCTURE (PONDS, STORM PIPES, OUTLETS, INLETS, ROADSIDE DITCHES, ETC.), AND RESTORE VOLUME CAPACITY UPON COMPLETION OF PROJECT OR PRIOR TO INITIAL ACCEPTANCE OF PUBLIC IMPROVEMENTS (IF APPLICABLE). DO NOT FLUSH SEDIMENT OFFSITE, CAPTURE ON-SITE AND DISPOSED OF AT AN APPROVED LOCATION.

THESE NOTES ARE NOT INTENDED TO BE ALL-INCLUSIVE, BUT TO HIGHLIGHT THE BASIC STORMWATER POLLUTION PREVENTION REQUIREMENTS FOR CONSTRUCTION ACTIVITIES TO COMPLY WITH CDPS STORMWATER CONSTRUCTION PERMIT AND BE IN CONFORMANCE WITH COUNTY STANDARDS.

Erosion Control Notes

Thornburg Pit

DRMS Permit Number: M1983060	**Bennett Creek Ranch LLC**
Mine Entry Location:	Latitude: ---- Longitude: ----
State: CO	County: Adams Nearest Town: Bennett
Section: 24	Township: 3S Range: 63W PM: 6th
Major Watershed:	Kiowa Creek
Map Scale: 1":	

0

N

Map Georeferencing Information:	**Datum: NAD83**	**Projection: CO CENTRAL**
Survey Source: CO LIDAR	**Drawn by:** LLD	Date: 8/27/2025
Imagery Source: Google	**Checked by:** BEL	Date: 11/24/24
Survey Date: 2013	**Approved by:** BEL	Date: 11/24/24
Imagery Date: 2024		

File Name: Thornburg Pit

Lewicki & Associates

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Littleton, CO USA 80123
(303)-346-5196
info@lewicki.biz

Bennett Creek Ranch – Floodplain Use Permit Application

August 31, 2025

By:

Bennett Creek Ranch, LLC

Represented by:

Lewicki & Associates

Contents

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1. Project Description

The Bennett Creek Ranch gravel mining operation is in Adams County, Colorado, approximately two miles northeast of Bennett, Colorado, on parcels 0181500000058 and 0181524200001. Bennett Creek Ranch, LLC proposes to continue gravel extraction from the existing Thornburg Pit over an estimated 20-30 year timeframe. The mining operation consists of three separate extraction pods strategically located within the central 78-acre mining area, maintaining a minimum 25-foot setback from all adjacent property boundaries. Figure 1 shows the site location.

The project involves continued gravel extraction from the existing Thornburg Pit with no fill, levees, or permanent structures proposed within the 100-year floodplain of Kiowa Creek. The private access road at 4545 Yulle Road provides site access and crosses the floodplain area. The FEMA mapped 100-year floodplain associated with Kiowa Creek partially enters the roughly 78-acre project site by crossing this private access road and extending slightly up the largest, southernmost drainage pathway.

The site has functioned as a mining and extraction operation for decades under Colorado Division of Reclamation, Mining and Safety permit M-1983-060. Site elevation ranges around 5380 feet AMSL with the project area designated as FEMA Flood Zone A. Zone A represents the 100-year Special Flood Hazard Area with no base flood elevations determined and no regulatory floodway designated. While the Zone A floodplain enters the site, no structures are proposed within the regulated floodplain areas.

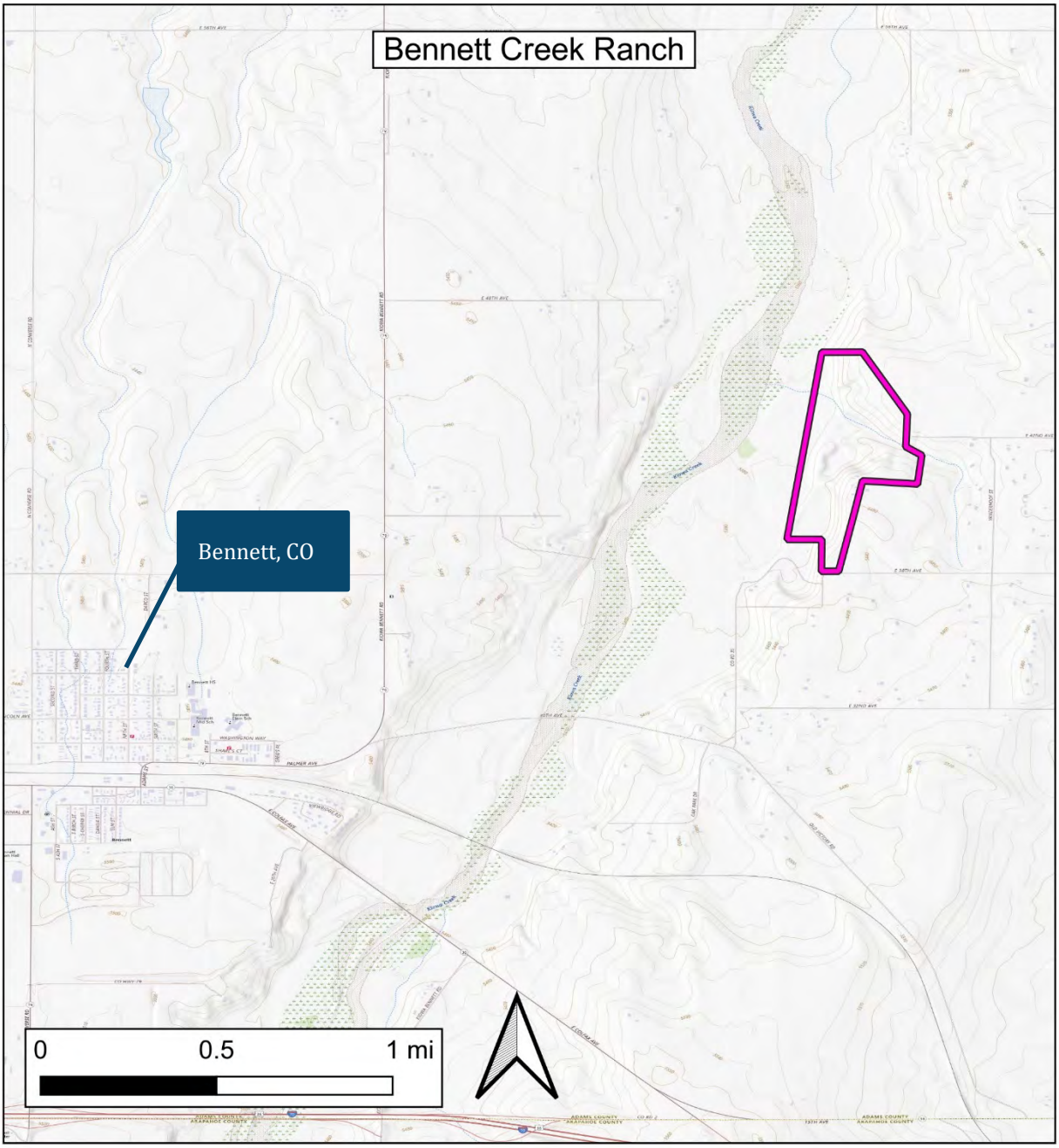


Figure 1. Location Map

2. Compliance Statement

The proposed Bennett Creek Ranch gravel mining operation will be designed and operated in full compliance with Adams County floodplain development standards, Federal Emergency Management Agency requirements, Colorado state regulations, and all applicable mining and environmental codes and standards. The operation maintains current Colorado Division of Reclamation, Mining and Safety permit M-1983-060 and Colo. Department of Public Health and Environment discharge permit COG502235, demonstrating ongoing regulatory compliance for mining activities.

3. Floodplain Analysis Summary

The floodplain analysis addresses FEMA Zone A conditions along Kiowa Creek where approximate flood limits are mapped using regional regression equations and topographic analysis rather than detailed hydraulic modeling. As documented in the FEMA Flood Insurance Study No. 08001CV003E (revised 2021), the original Zone A boundaries were developed using approximate methods based on drainage area relationships and available topographic data without site-specific hydraulic modeling.

A detailed HEC-RAS hydraulic model has been developed specifically for this project covering approximately 2.2 miles of Kiowa Creek, extending from just north of the railroad bridge (located approximately 1.1 miles south of the project area) to just south of the E 56th Avenue bridge (located approximately 1.1 miles north of the project area). Cross-sections were placed at approximately 500-foot intervals throughout this reach to provide detailed geometric representation of the channel and floodplain, as shown in the attached HEC-RAS cross section location map and individual cross section profiles.

The hydraulic model utilizes Manning's roughness coefficient values derived from the 2021 National Land Cover Database to accurately represent surface roughness conditions. Cross-section geometry was developed using Denver Regional Council of Governments LiDAR data to ensure precise topographic representation. The 100-year design flow was determined using USGS StreamStats methodology, with the complete Kiowa Creek StreamStats report attached to this submittal. HEC-RAS modeling results are summarized in the attached HEC-RAS summary output table.

This detailed hydraulic analysis represents superior methodology compared to FEMA's original approximate study methods and provides the technical foundation for demonstrating reduced floodplain extents compared to the approximate Zone A mapping. The access road elevation at 4545 Yulle Road is approximately 5380 feet AMSL with detailed flood depth analysis conducted using the site-specific hydraulic model for the Zone A crossing area. This detailed modeling approach supersedes the approximate Zone A boundaries for engineering analysis purposes and provides more defensible flood impact conclusions.

The mining operation consists of three distinct mining pods strategically positioned between ephemeral drainage channels. No mining activities occur within the 100-year floodplain

boundaries. Temporary stockpile locations are situated outside floodplain areas, and progressive restoration proceeds concurrently with mining advancement to maintain site stability and drainage function. Figure 2 shows a map of the site including the mining pods and both the FEMA Zone A floodplain mapping and the HEC-RAS floodplain mapping.

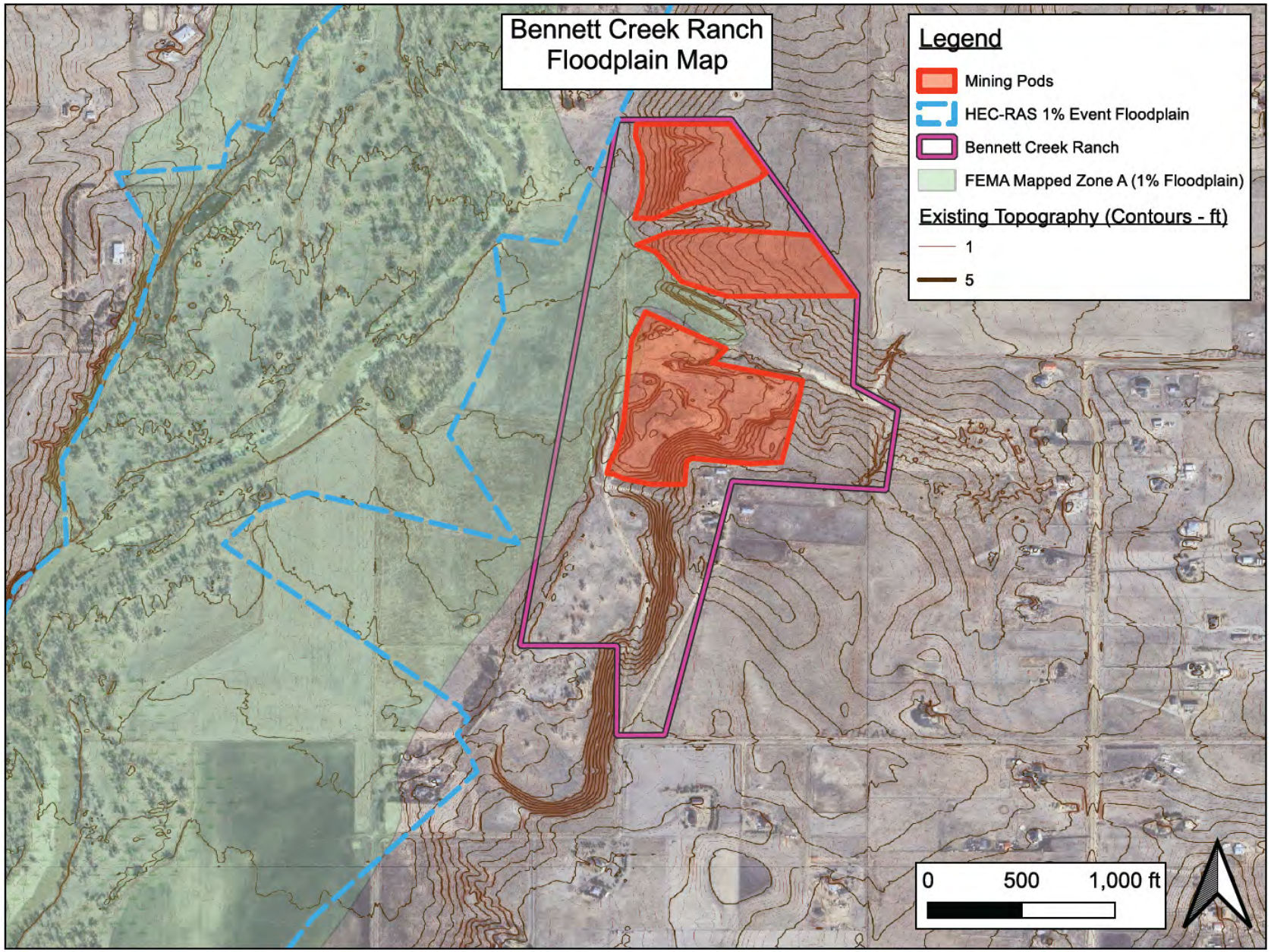


Figure 2. Floodplain Map of Site

Comprehensive flood impact analysis demonstrates no adverse effects to upstream or downstream properties within the Zone A floodplain. The proposed operation maintains existing flood flow patterns and does not reduce floodplain storage capacity. Natural flood flows remain unobstructed, and access road flood characteristics have been thoroughly evaluated. The attached No-Rise Certification provides detailed hydraulic modeling demonstrating no increase in flood elevations resulting from the proposed mining activities.

Access road analysis addresses road elevation relative to anticipated flood levels within Zone A, flood duration and depth calculations based on detailed hydraulic modeling, and emergency access and egress procedures during potential flood events to ensure operational safety and regulatory compliance. The Yulle Road access at approximately 5380 feet AMSL provides the primary route for mining operations with up to 200 truck trips per day.

4. Operation Specific Considerations

4.1. Hydraulic Analysis Methodology.

The original FEMA Zone A boundaries along Kiowa Creek were developed using approximate methods and regional regression equations as documented in the FEMA Flood Insurance Study No. 08001CV003E (revised 2021). This analysis employs detailed site-specific HEC-RAS hydraulic modeling utilizing DRCOG LiDAR data for cross-section geometry, Manning's roughness values based on the 2021 National Land Cover Database, and design flow determination from the attached Kiowa Creek StreamStats report. The model extends 2.2 miles along Kiowa Creek with cross-sections at 500-foot intervals, as shown in the attached cross section location map, providing more accurate flood elevations and flow patterns than the original approximate Zone A delineation. The detailed methodology employed herein supersedes the approximate Zone A boundaries for engineering analysis and regulatory compliance purposes.

4.2. Reduced Floodplain Extents.

The detailed HEC-RAS hydraulic analysis reveals a significant finding regarding floodplain extents at the Bennett Creek Ranch site. The site-specific modeling demonstrates that the actual 100-year floodplain for Kiowa Creek does not extend into the project area to the degree shown by FEMA's approximate Zone A mapping, as clearly illustrated in the attached comparative floodplain mapping. This finding indicates that FEMA's original approximate delineation methods, which relied on regional regression equations and limited topographic data, resulted in overly conservative floodplain boundaries for this location. The precise hydraulic modeling using DRCOG LiDAR topography and detailed cross-sectional analysis provides definitive evidence that the Thornburg Pit mining operations are positioned well outside the actual 100-year floodplain limits, providing an additional margin of safety beyond what was previously understood from the approximate Zone A mapping. The HEC-RAS summary output table documents the specific water surface elevations and floodplain extents determined through this detailed analysis.

The 100-YR Floodplain Exhibit shows the cross sections through the project area and the location of the 100-YR flood level relative to the mining pods.

4.3. Floodplain Protection Measures.

All mining activities are carefully positioned outside the Kiowa Creek FEMA Zone A floodplain limits as determined by detailed hydraulic analysis to eliminate any potential interference with flood flows or storage. No permanent structures, fill materials, or levees are proposed within the Zone A regulated area. Temporary stockpiles are strategically positioned to avoid any interference with natural flood flow patterns along Kiowa Creek and its tributary drainages. Comprehensive mining equipment evacuation procedures have been developed for implementation during flood events to protect both equipment and environmental resources.

4.4. Drainage Management.

The existing ephemeral drainage patterns across the site will be maintained throughout the mining operation to preserve natural hydrology. No diversions or obstructions of natural flow paths are proposed as part of the mining plan. Sediment control measures are implemented according to the approved Stormwater Management Plan to protect downstream water quality. Progressive restoration activities maintain proper drainage function as mining advances through different areas of the property.

4.5. Access Road Considerations.

The private access road necessarily crosses the Zone A floodplain area to provide site access for mining operations. The road is designed to accommodate calculated flood depths during the 100-year flood event while maintaining structural integrity. Alternative access routes have been identified for use during extended flood periods if applicable. All road construction and maintenance activities are planned and executed to avoid any negative impacts on flood conveyance capacity through the Zone A crossing area.

4.6. Operational Flood Management.

Comprehensive weather monitoring and flood warning procedures ensure adequate advance notice of potential flooding conditions. Equipment and material relocation protocols provide detailed steps for protecting mining assets during flood events. Coordination procedures with local emergency management agencies ensure proper communication and response during flood emergencies. Post-flood inspection and restoration procedures guarantee prompt return to safe mining operations following any flood events that may affect the site.

5. Professional Certification

I, Benjamin Langenfeld, Professional Engineer licensed in the State of Colorad, do hereby certify that the technical data and analysis contained herein are accurate and complete based on accepted engineering principles and practices. The proposed Bennett Creek Ranch gravel

mining development complies with all applicable floodplain management regulations and will not adversely impact flood flows or storage capacity within the FEMA Zone A area.

The detailed site-specific HEC-RAS hydraulic modeling demonstrates that the actual 100-year floodplain extents for Kiowa Creek are significantly reduced compared to FEMA's approximate Zone A mapping boundaries, as illustrated in the attached comparative floodplain mapping. The 1% annual chance flood event does not inundate the project site to the extent shown by the original FEMA Zone A delineation. This detailed hydraulic analysis employs superior methodology compared to FEMA's original approximate Zone A delineation methods documented in FIS No. 08001CV003E (revised 2021), utilizing DRCOG LiDAR-derived cross-sections, NLCD-based Manning's values, design flows from the Kiowa Creek StreamStats report, and precise topographic modeling rather than regional regression equations. The more accurate hydraulic modeling approach provides defensible engineering conclusions that supersede the approximate Zone A boundaries for flood impact assessment purposes, as documented in the attached HEC-RAS summary output table and cross section profiles.

No permanent structures are proposed within the regulated floodplain as determined by the detailed hydraulic analysis, and the mining operations are positioned outside the actual 100-year floodplain limits during the estimated 20-30 year extraction timeline. This analysis was prepared under my direct supervision and professional oversight in accordance with Colorado engineering practice standards.



Attachments

- FEMA Flood Insurance Study No. 08001CV003E (revised 2021)
- FEMA flood maps and current FIRM panel
- Kiowa Creek StreamStats report for 100-year flow determination
- HEC-RAS hydraulic modeling results showing reduced floodplain extents
- HEC-RAS summary output table
- Map of HEC-RAS cross section locations
- HEC-RAS cross sections
- 100-YR Floodplain Exhibit

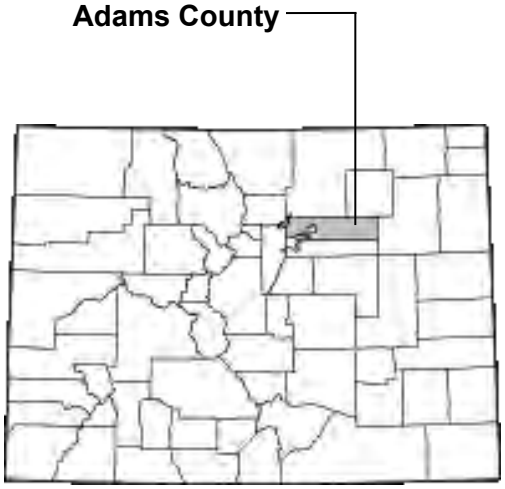
FLOOD INSURANCE STUDY



VOLUME 1 OF 4

ADAMS COUNTY, COLORADO
AND INCORPORATED AREAS

Community Name	Community Number
ADAMS COUNTY (UNINCORPORATED AREAS)	080001
BENNETT, TOWN OF	080003
BRIGHTON, CITY OF	080004
COMMERCE CITY, CITY OF	080006
FEDERAL HEIGHTS, CITY OF	080240
NORTHGLENN, CITY OF	080257
THORNTON, CITY OF	080007



REVISED
December 2, 2021

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
08001CV001E

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS report. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS report components.

This FIS report was revised on December 2, 2021. Users should refer to Section 10.0, Revisions Description, for further information. Section 10.0 is intended to present the most up-to-date information for specific portions of this FIS report. Therefore, users of this report should be aware that the information presented in Section 10.0 supersedes information in Sections 1.0 through 9.0 of this FIS report.

Initial Countywide FIS Effective Date: August 16, 1995

Revised FIS report Dates: March 5, 2007
January 20, 2016
February 17, 2017
September 28, 2018
December 2, 2021

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Bear Gulch	Panels	006P-013P
Bear Gulch Tributary D	Panels	014P-015P
Bear Gulch Tributary E	Panel	016P
Bear Gulch Tributary G	Panels	017P-019P
Big Dry Creek	Panels	020P-029P
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Box Elder Spill 5	Panels	052P-053P
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Clear Creek North Overflow	Panels	066P-067P
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Grange Hall Creek 104th Avenue Tributary	Panel	114P
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Flood Insurance Rate Maps

FLOOD INSURANCE STUDY

ADAMS COUNTY, COLORADO, AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates information on the existence and severity of flood hazards in the geographic area of Adams County, including the Cities of Brighton, Commerce City, Federal Heights, Northglenn, and Thornton; the Town of Bennett; and the unincorporated areas of Adams County (referred to collectively herein as Adams County), and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood-risk data for various areas of the community that will be used to establish actuarial flood insurance rates and to assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

The Town of Bennett is geographically located in both Arapahoe and Adams Counties, but is included in its entirety in this FIS report. The Cities of Arvada and Westminster are geographically located in both Adams and Jefferson counties, but are excluded from this FIS report, and included in their entirety in the Jefferson County FIS report. The City of Aurora is geographically located in more than one county, but is excluded from this FIS report, and is included in its entirety in the Arapahoe County FIS report.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence, and the State (or other jurisdictional agency) will be able to explain them.

The Digital Flood Insurance Rate Map (DFIRM) and FIS Report for this countywide study have been prepared using digital data. Flood hazard information was converted to meet the Federal Emergency Management Agency (FEMA) DFIRM database specifications and geographic information standards and is provided in a digital format so that it can be incorporated into a local Geographic Information System (GIS) and be accessed more easily by the community.

1.2 Authority and Acknowledgments

The sources of authority for this FIS report are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the original studies for the unincorporated areas of Adams County and the Cities of Brighton, Commerce City, Northglenn, and

Thornton were performed by Gingery Associates, Inc., for the Federal Insurance Administration (FIA), under Contract No. H-3716. The work for those studies was completed in August 1976, November 1976, March 1977, and April 1979, respectively.

For the unincorporated areas of Adams County, approximate flood boundaries for standing bodies of water greater than 25 acres were arbitrarily determined in February 1977, by Dames & Moore, under contract to the FIA.

The Adams County study was revised on December 15, 1989, to modify the Special Flood Hazard Areas (SFHAs) along a reach of the South Platte River, Approximately 2.3 miles long. The revised reach extended form a point approximately 760 feet downstream of the westbound lane of Interstate Highway 270, upstream to the south boundary of Adams County, at the City and County of Denver corporate limits (Franklin Street).

The basis for the 1989 revision is revised hydraulic analyses conducted by Wright Water Engineers, Inc., Denver, Colorado, under contract to the Urban Drainage and Flood Control District (UDFCD). The revised hydraulic analyses utilized the U.S. Army Corps of Engineers (USACE) HEC-2 hydraulic computer model and were conducted in August 1986 and September 1987. The hydraulic reanalyses modified the 1- and 0.2-percent-annual-chance flood boundaries and increased the base (1-percent-annual-chance) flood elevations (BFEs) along portions of the South Platte River by up to 5 feet. A floodway was not analyzed for this reach due to the split flow situations along the South Platte's floodplain.

The 1989 revision also incorporated a Letter of Map Revision (LOMR) issued on September 28, 1988 for Third Creek in the unincorporated areas of Adams County. The purpose of the LOMR was to reflect channel modification and lot grading through Third Creek Estates Subdivision downstream of East 132'1 Avenue. The 1989 revision also incorporated a LOMR issued on July 21, 1987, for the completion of a flood control project in the vicinity of Hidden Lakes Drainageway, in unincorporated areas of Adams County. Based on data submitted with the LOMR, the 1-percent-annual-chance flood boundaries were revised to reflect approximately 0.8-mile of channel modifications along Lowell Boulevard, located south of West 67th Avenue.

Additional hydraulic analyses within the City of Commerce City were completed by Simons, Li, and Associates, Inc., in June 1987, to reflect channel modifications for a reach of Sand Creek between Vasquez and Brighton Boulevards. Revised hydraulic analyses were also conducted for a reach of the South Platte River, from approximately 760 feet downstream of westbound Interstate Highway 270 to the upstream corporate limits of Commerce City at Franklin Street, by Wright Water Engineers, Inc., under contract to the UDFCD.

The hydraulic re-analyses for the reach of the South Platte River through Commerce City were completed in September 1987.

The hydrologic and hydraulic analyses for detailed areas in the City of Federal Heights were performed by Greiner Engineering Sciences, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-83-C-1173. That study was

completed in July 1984. Additional approximate analyses in that study were performed by the Colorado Water Conservation Board (CWCB) (Reference 1).

The August 16, 1995 revision (Reference 2) combined the FIRMs and FIS reports of the County and incorporated cities into the countywide format. Under the countywide format, FIRM panels have been produced using a single layout format for the entire area within the county instead of separate layout formats for each community.

For the 2007 countywide FIS report, revised hydrologic and hydraulic analyses were taken from reports prepared for the UDFCD on Box Elder Creek, Clear Creek, and the South Platte River. These analyses were completed by Wright Water Engineers, Inc., Ayers Associates, Inc., and Camp Dresser & McKee, Inc., respectively, under contract with the UDFCD. Revised hydraulic analyses along Box Elder Creek were completed from the Weld County Boundary at 168th Avenue to approximately 9,730 feet upstream of East 72nd Avenue. Revised hydraulic analyses along Clear Creek were completed from the confluence with the South Platte River to the Jefferson County boundary at Sheridan Boulevard. Revised hydraulic analyses along the South Platte River were completed from the Weld County boundary at 168th Avenue to the City and County of Denver boundary at Franklin Street.

Under the countywide format, FIRM panels have been produced using a single layout format for the entire area within the county instead of separate layout formats for each community. The single layout format facilitates the matching of adjacent panels and depicts the flood hazard area within the entire panel border, even in areas beyond a community corporate boundary line. In addition, under the countywide format, this single FIS report provides all FIS information and data for the entire county area.

The mapping for the countywide conversion was prepared using digital TIGER files obtained from the U.S. Department of Commerce, Bureau of the Census. Previously published FIRM data produced manually was converted to vector digital data by a digitization process. These vector digital data were fit to raster digital images of the USGS quadrangle maps of the county area to provide horizontal positioning.

The 1995 revision also incorporated revisions to the flooding along Clear Creek to reflect the hydrologic and hydraulic analyses prepared in a 1979 UDFCD report (Reference 59). The revised flooding was included as a detailed analysis and updates the flooding shown on the previous effective maps. Floodway and 0.2-percent-annual-chance floodplain boundaries were not determined. The revisions to Clear Creek are reflected in the profiles and on the FIRMS.

For Brantner Gulch, the study replaced existing Zone A flooding shown previously and added new Zone A Special Flood Hazard Areas (SFHAs). The LOMR issued to the City of Thornton on December 16, 1992, to revise the Zone A SFHA along Brantner Gulch between 123"I and 124th Avenues and Colorado Boulevard and Monroe Street, was superseded by the information presented for Brantner Gulch (Reference 63). The existing detailed flooding show from Colorado Avenue to approximately 2,600 feet downstream of Colorado Avenue was not revised.

A new Zone A SFHA was added for Direct Flow Area 0054-1 from its confluence with the South Platte River upstream to Holly Street. The LOMR issued to the City of Thornton on January 19, 1989, to revise the Zone A SFHA from Holly Street upstream to East 112th Avenue was not superseded by this study. The SFHA was continued north of East 112th Avenue.

New SFHAs were also added for: McKay Lake Drainageway, Morris Creek, Mustang Run, North Tributary VII to Brantner Gulch, Preble Creek, South Fork Preble Creek, Quail Creek, Sack Creek, Sack Creek South, Shay Ditch, Short Run, Tributary 4 to Todd Creek, Wadley North Creek, and Wadley South Creek Flooding was revised and added to Todd Creek and Tributary 2 to Todd Creek.

The flood information was provided by the U.S. Department of the Interior, Bureau of Reclamation, under Inter-Agency Agreement No. EMW-90-E-3456, as part of the Limited Map Maintenance Program. The source of the flood data for the identified stream was UDFCD Flood Hazard Area Delineation reports (References 60 through 64).

The following LOMRs were included in the 2007 update. The LOMR issued January 19, 1989, for the City of Thornton, revised the Zone A SFHA delineations along East 112th Avenue and the area southeast of East 112th Avenue to Holly Street, reflecting major drainage improvements completed. The LOMR issued June 9, 1992, for the City of Commerce City, incorporates modifications to the floodway along Sand Creek in the vicinity of East 49th Street. The LOMR issued June 21, 1994, for the City of Thornton incorporates modifications to the floodplain boundary delineations along Niver Creek from Washington Street upstream to Interstate Highway 25. The LOMR issued July 14, 1994, for the City of Northglenn, revised the FIRM to reflect elevation by the placement of fill along Grange Hall Creek North Tributary.

Base map information shown on the digital FIRM was provided by the Adams County and Commerce City GIS Departments. The coordinate system used for the production of the digital FIRM is Universal Transverse Mercator Zone 13N referenced to North American Datum of 1983 and the GRS 80 spheroid, Western Hemisphere.

1.3 Coordination

An initial Consultation Coordination Officer (CCO) meeting (also occasionally referred to as the Scoping meeting) is held with representatives of the communities, FEMA, and the study contractors to explain the nature and purpose of the FIS and to identify the streams to be studied by detailed methods. A final CCO (often referred to as the Preliminary DFIRM Community Coordination, or PDCC, meeting) is held with representatives of the communities, FEMA, and the study contractors to review the results of the study.

The coordination for the original Adams County FIS was completed in multi-agency conferences managed by FEMA.

Officials of the Adams County Planning Commission, the Colorado Highway Department, the CWCB, the UDFCD, the USGS, the U.S. Soil Conservation Service

(SCS), the U.S. Bureau of Reclamation, the USACE, Omaha District, the Denver Post newspaper, and local residents were contacted throughout the study; available maps, flood data, and historical information were obtained.

On October 23 and November 28, 1975, public hearings were held by the Adams County Planning Commission to review the floodplains within the county. A final community coordination meeting was held with the public and representatives from Gingery Associates, the Adams County Planning Commission, the UDFCD, and the FIA on August 26, 1976, to present and discuss the flood information prepared for the county. There were no problems raised at that meeting.

The initial coordination meetings for the Cities of Brighton, Commerce City, and Northglenn were held at a meeting attended by personnel of Gingery Associates, Inc., the FIA, and officials of the communities on February 12, 1976. The base map and topographic mapping used for that study were furnished by the communities, and the streams requiring detailed study were identified. On October 26, 1976, a final community coordination meeting was held with the City of Brighton. On March 7, 1977, a final community coordination meeting was held with the City of Commerce City, where results of the FIS were presented to city officials and residents. On July 25, 1977, a final community coordination meeting was held with the City of Northglenn.

The draft report of the detailed study for the City of Federal Heights was discussed at a coordination meeting attended by representatives of the City of Federal Heights, FEMA, and the study contractor on April 25, 1983. Approximate analyses for Federal Heights were approved by FEMA for use in the FIS. The final community coordination meeting was held on April 2, 1985, and was attended by representatives of FEMA, the study contractor, and the City.

Community based map selection and identification of streams requiring detail study in the City of Thornton were accomplished in an initial coordination meeting attended by personnel of the study contractor, the FIA, and the UDFCD, as well as officials of the City of Thornton on March 11, 1976. A final community coordination meeting was held with the City of Thornton on July 25, 1977.

For the 2007 countywide FIS report, an initial coordination meeting was attended by FEMA; Adams County; the Cities of Commerce City, Northglenn, and Thornton; the Town of Bennett; the CWCB; the UDFCD; Michael Baker, Jr., the National Service Provider; and ICON Engineering, Inc., the study contractor, on October 5, 2004. At that meeting, the communities were notified that their FIS report and FIRM would be converted to a Digital FIRM (DFIRM) format. Additionally, streams to be added as detailed studies and approximate studies were selected, and base mapping and topographic mapping was provided by Adams County along with the City of Commerce City. Additional correspondence was held with the Cities of Brighton and Federal Heights. Base mapping and topographic mapping was also provided by Federal Heights.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS report covers the geographic area of Adams County, Colorado, including the incorporated towns and cities, except communities which fall within more than one county as described in Section 1.1. The scope and methods of this study were proposed to, and agreed upon, by FEMA and Adams County. Streams that were studied by detailed methods are listed in Table 1.

Table 1: Streams Studied by Detailed Methods

Stream	Limits of Detailed Study
Basin 4100	From Cypress Drive to approximately 200 feet upstream of Thornton Parkway
Bear Gulch	From the confluence with Box Elder Creek to City of Aurora boundary located 10,040 feet upstream of 48th Avenue
Bear Gulch Tributary D	From the Adams County boundary, located approximately 440 feet upstream of the confluence with Bear Gulch, to approximately 3,800 feet upstream of the confluence with Bear Gulch.
Bear Gulch Tributary E	From the confluence with Bear Gulch to approximately 1,200 feet upstream of the confluence with Bear Gulch.
Bear Gulch Tributary G	From the confluence with Bear Gulch to approximately 5,600 feet upstream of the confluence with Bear Gulch.
Big Dry Creek*	From the Adams-Weld County boundary to the Adams-Jefferson County Boundary
Box Elder Creek	From the Weld County boundary at 168th Avenue to approximately 9,730 feet upstream of 72nd Avenue.
Brantner Gulch	From approximately 1,400 feet downstream of to approximately 900 feet upstream of Bellaire Drive.
Clear Creek	From the confluence with the South Platte River to the Jefferson County boundary at Sheridan Boulevard.
Comanche Creek	From the Weld County boundary at 168th Avenue to the Arapahoe County boundary at Highway 36.
Grange Hall Creek	From Riverdale Road to Interstate 25.
Grange Hall Creek North Tributary	From the confluence with Grange Hall Creek to Irma Drive.
Grange Hall Creek Northeast Tributary	From the confluence with Grange Hall Creek to Union Pacific Railroad.
Grange Hall Creek South Tributary	From the confluence with Grange Hall Creek to Huron Street.

Stream	Limits of Detailed Study
Hayesmount Creek	From the Weld County boundary at 168th Avenue to the City and County of Denver boundary located 2,720 feet upstream of East 120th Avenue.
Hayesmount Creek East Tributary	From the confluence with Hayesmount Creek to approximately 13,000 feet upstream of the confluence with Hayesmount Creek.
Hayesmount Creek West Tributary	From the confluence with Hayesmount Creek to approximately 11,710 feet upstream of 128th Avenue.
Little Comanche Creek	From the confluence with Comanche Creek to the Arapahoe County boundary at Highway 36.
Little Dry Creek	From West 64th Avenue to Lower Boulevard.
Niver Creek	From the confluence with South Platte River to Washington Street.
Niver Creek Tributary M	From Pecos Street to approximately 300 feet upstream of Elm Court.
Northfield Creek (Downstream of UPPR)	From the confluence with South Platte River to Devonshire Boulevard.
Northfield Creek (Upstream of UPPR)	From Devonshire Boulevard to East 88th Avenue.
Sand Creek	From the confluence with south Platte River to approximately 600 feet upstream of East 49th Avenue.
South Platte River	From the Weld County boundary at 168th Avenue to the City and County of Denver boundary at Franklin Street.
Tanglewood Creek	From the confluence with Big Dry Creek to Interstate 25.
Wolf Creek	From the confluence with Comanche Creek to the Arapahoe County boundary at Highway 36.

*Flooding source was updated as part of the 2018 revision

All or portions of the streams in Table 2 were studied by approximate methods in previous FIS for Adams County and Incorporated Areas (References 2 through 5 and 7 through 11).

Table 2: Streams Studied by Approximate Methods

Bijou Creek
Portions of Brantner Gulch
DFA 0054-1
East Bijou Creek
First Creek
Portions of Grange Hall Creek
Grange Hall Tributary Southeast

Hidden Lake
Kiowa Creek
Lost Creek
McKay Lake Drainageway
Morris Creek
Muddy Creek
Mustang Creek
Niver Canal
Portions of Niver Creek
Niver Creek Tributary L
Portions of Niver Creek Tributary M
Portions of Northfield Creek
Preble Creek
Quail Creek
Sack Creek
Second Creek
Shay Ditch
Short Run
South Fork Preble Creek
South Sack Creek
Third Creek
Todd Creek
Tributary 2 to Todd Creek
Tributary 4 to Todd Creek
Tributary to Brantner Gulch
Tributary II to Brantner Gulch
Tributary VII to Brantner Gulch
Wadley North
Wadley South
West Bijou Creek

For the 2007 countywide FIRM, the existing FIRM was converted to a Digital FIRM (DFIRM). Detailed analyses were taken from the effective FIRM or from existing UDFCD reports. The existing detailed analysis was originally used in developed areas or areas with a high development potential. The existing approximate analysis was originally used to study those areas for which detailed information was not available or those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA, CWCB, UDFCD, Adams County, and the incorporated communities within Adams County.

2.2 Community Description

Adams County is located in central Colorado, just north and east of Denver, the state capital. The general shape of the physical boundary resembles a rectangle that is 18 miles wide by 72 miles long. Extending from near the foothills of the Rocky Mountains easterly to the open plains of the state, Adams County covers approximately 1,180 square miles. It is bordered on the north by Morgan and Weld Counties, on the east by

Washington County, on the south by Arapahoe and Denver Counties, and on the west by Jefferson and Broomfield Counties.

The City of Brighton is located in north central Adams County. Brighton has grown from a stagecoach stop in the early 1860s, to a rapidly growing city at the fringe of the Denver metropolitan area. The City originally based its economy on agriculture, which expanded rapidly after development of an extensive irrigation system in the early 1900s. Today, agriculture still plays a significant role in the economy; however, the pressures of urban growth are currently changing this emphasis. The community has grown steadily over the years since its incorporation, but its pace has dramatically changed since 1970 by an increase in population of over 400 percent, from 8,309 in 1970 to 34,069 in 2010 (Reference 6).

Commerce City is situated in the southwestern corner of Adams County. The City is 15 miles south of Brighton, the county seat. The City and County of Denver, the state capital, and the U.S. Army's Rocky Mountain Arsenal border the City on the east. The City and County of Denver also forms the southern boundary, and Adams County adjoins Commerce City to the north and west.

Commerce City was first incorporated in December of 1952 and named Commerce Town. The population increased 750 percent from 1,200 in 1952 to 9,000 in 1960, at which time Commerce Town became Commerce City. As of 1980, the City had a population of approximately 16,230. In 2010, the population was estimated to be approximately 45,913 (Reference 6).

The City of Federal Heights is located in west-central Adams County, approximately 5 miles north of the City and County of Denver corporate limits and 1.5 miles east of the Jefferson County line. Federal Heights is bordered by the Cities of Thornton on the east, Westminster on the west, and Northglenn on the northeast. Federal Heights experienced much growth between 1970, when the population was 1,502, and 1980, when the population figure was 7,846 (Reference 14). In 2010, the population was estimated to be approximately 11,467 (Reference 6).

The City of Northglenn is located in west-central Adams County, Colorado, and is approximately 6 miles north of Denver. The City is bounded by the City of Thornton to the east, north, and south, and the City of Westminster to the west. Development in the City of Northglenn is mainly residential, except for small areas of retail and service related industry. In 2010, the population of the City of Northglenn was 35,789 (Reference 6).

The City of Thornton is located in the west-central part of Adams County, approximately 6 miles north of Denver. The City is bounded by the City of Northglenn to the northwest, by the Town of Federal Heights to the west, and by the unincorporated areas of Adams County to the east and south. Thornton first became incorporated in 1956. In terms of population, the growth of Thornton has been sporadic. The population from 1960 to 1970 only increased by 1,988; yet, from 1970 to the 1976 estimate, the City had increased by 18,084 to the 1976 estimated population of 31,425 (References 15 and 16). In 2010, the

population for the City of Thornton was 118,772 (Reference 6).

The Town of Bennett was incorporated in 1930 with a population of 211. Bennett is located just north of Interstate Highway 70 in Eastern Adams County, 25 miles from the City and County of Denver (Reference 13). The Town is bounded by unincorporated Adams County to the north, west and east, and by unincorporated Arapahoe County to the south. In 2010, the population was 2,308 (Reference 81).

The climate varies slightly from the Denver metropolitan area to the prairie lands in the east; but, generally, it is characteristic of the temperate high plains. The mean annual temperature is 50 degrees Fahrenheit (°F) with a mean annual snowfall of 60.1 inches and rainfall of 15.5 inches. The mean growing season is 166 days (Reference 82).

Adams County was fragmented from Arapahoe County in November 1902, by the state legislature. During the early days of national expansion and exploration, Adams County was visited by many trappers and explorers, including General Zebulon Pike in 1806 and General John C. Fremont in 1853. When gold was discovered along Clear Creek and elsewhere in the Rocky Mountain foothills, extensive growth was experienced, and permanent settlement began. In 1858, Colonel Jack Henderson established the first permanent settlement, called Henderson's Island, near what is now the Town of Henderson. The Kansas Pacific and the Denver Pacific Railroads, in 1871, built lines through what is now the City of Brighton, bringing the impetus for increased cattle production and agricultural development along the South Platte River Valley.

Today, Adams County is one of the richest irrigated and dry land farming areas in the country. The southwestern corner of the county has undergone heavy industrial and residential development. In recent years the county has experienced a rapid growth in population resulting from Denver metropolitan area urbanization and subsequent suburban development. The U.S. Census Bureau lists county population figures for 1970, 1974, and 1980 (projected) as 185,789; 225,600; and 263,827, respectively. In 2004, the population was approximately 398,165 (Reference 6).

The South Platte River flows through the county in shifting channels in a broad, shallow bed with low, flat overbanks. It is a continuous flowing stream, whereas all the tributaries except Clear Creek are intermittent flowing streams. The South Platte River and its tributaries have two major flooding characteristics, snow melt and summer weather fronts or thunderstorms. The tributary basins are narrow, hydraulically steep, and composed of highly erodible clay and loam soils. In the undeveloped portions of the basins, the ground cover is predominantly short grass called buffalo grass and willow and cottonwood trees.

Development has occurred up to the channels on the tributaries. The floodplain on the South Platte River in the past was mostly agricultural, but today commercial, industrial, and residential development has encroached into the floodplain.

2.3 Principal Flood Problems

Major recorded floods have occurred on the South Platte River and its tributaries since

1844 in the Adams County area. During that period, eleven devastating floods have occurred on the South Platte River, three on Clear Creek, and three each on Box Elder, Comanche, and Bijou Creeks.

In 1844 and 1864, reports stated that "bottomlands near Denver were covered with water bluff to bluff' (Reference 20). By 1876, encroachment into the floodplain had developed to such an extent that on May 23, 1876, the Rocky Mountain News reported that, "[The South Platte River] was higher to be sure...several feet higher perhaps in 1864... but it was not able to work such destruction at that time as now. There was not so much town here in 1864, as now, nor as many bridges" (Reference 17).

The most significant floods of recent times on the South Platte River occurred in 1912, 1921, 1933, 1935, 1942, 1965, and 1973. The discharges for these floods were 13,000 cubic feet per second (cfs), 8,790 cfs, 22,000 cfs, 12,320 cfs, 10,200 cfs, 40,300 cfs, and 33,000 cfs, respectively, at the Denver gage. Clear Creek experienced flood discharges of 8,700 cfs, 5,390 cfs, and 5,250 cfs in 1888, 1933, and 1956, respectively recorded at the Golden gage. Citizens interviewed in Watkins, Strasburg, Byers, and Deer Trail recalled severe damage and lives lost in 1905, 1933, 1935, and 1965 floods on Box Elder Creek, Comanche Creek, West Bijou Creek, and East Bijou Creek.

Almost all record floods on the South Platte River have been generated near the river's headwaters on the slopes of Monument Divide, a high ridge located between Castle Rock and Colorado Springs, extending from the Rocky Mountains down to the plains near Limon, Colorado. Past floods have resulted from snowmelt and intensive rain storms over the mountain tributaries, rainstorms over the eastern tributaries, and combinations of these conditions.

In 1965, a unique combination of orthographic effects and meteorological conditions in the South Platte River Basin caused the worst flooding in the region's recorded history. Severe thunderstorms commenced over the headwaters of Plum Creek and Cherry Creek on June 16, and moved northeasterly down the creeks following and augmenting peak flows. More than 14 inches of rain were recorded at Palmer Lake in 4 hours. Overnight, westerly winds moved the storm front to a position over the Kiowa and Bijou Creek Basins where it met with thunderstorms forming just south of Agate. Here, 5.25 inches fell in 45 minutes. The net results of these conditions were six people drowned, two other deaths caused by flood-related activities, and estimated damages of $500 million in the South Platte River Basin, of which $300 million occurred in the Denver area.

Major floods affecting the City of Commerce City area have occurred on the South Platte River and Sand Creek since 1844. During that period, 11 floods occurred on the South Platte and 10 notable floods occurred on Sand Creek.

The major cause of floods on the South Platte River and Sand Creek are cloudbursts of intensive rainstorms which normally occur during the period of May through August. The South Platte River flooding is also aggravated by snowmelt runoff on the tributary streams during the rainstorm period.

There are two areas of shallow sheet flow within Commerce City, both of which are along Sand Creek. The upstream area is on the southwest side of Sand Creek between the corporate limits and east 49th Drive. In this area, the ground slopes away from the channel, and the flow cannot return. The second area is under interstate Highway 270, at the two railroad underpasses to the northwest. During a large flood event, the flood waters will pass under the interstate bridge and flow along the low ground away from the channel, returning to the South Platte River north of East 64th Avenue.

Severe flood runoff is transported through the City of Federal Heights as both overland shallow flow and as channel flow. The steep slope of the land, the close proximity of mobile homes to Tributary M of Niver Creek, and the presence of several culverts that are inadequate to convey major storm runoff combine to create flooding problems.

The runoff upstream of Zuni Street is overland flow that can overtop roads and inundate mobile home trailers. The average slope is 3.5 percent; therefore, excessive velocities occur.

Downstream of Zuni Street, the runoff flows through the culverts and well-defined channels; however, there is some overland flow. Roads and mobile homes can be inundated. The average slope in this area is 1.5 percent.

On June 13, 1984, severe rainfall runoff cause considerable damage to mobile home trailers, to private property, and to the channel. One fatality was directly attributed to the shallow overland flow. Unofficial estimates gave the peak discharge from the storm as 800 to 1,000 cfs at Pecos Street; this was the result of a 4.2-inch rainfall, which fell within 3 hours. The discharge is comparable to a 1-percent-annual-chance event. The extent of inundation shown in this FIS is approximately the same as that which occurred during the June 1984 event.

Similar flooding problems as those outlined above could occur in the floodplains of Niver Creek and Tributary L of Niver Creek in the event of further development.

Much of Niver Creek's floodplain is in park land. However, downstream near Zuni Street, mobile homes are located in the approximate floodplain. At the upstream end of Niver Creek, streets and homes in low areas were affected during the June 1984 flood event.

The main cause of floods in the City of Northglenn is cloudbursts, which usually occur during the months of May through August.

Documentation of historical floods and damage estimates on the streams within corporate limits of Northglenn is sparse. The streams have caused overland inundation of homes and streets, but no discharge or damage estimates have been recorded.

The main cause of floods in the City of Thornton is cloudbursts which normally occur during the period of May through August.

Documentation of historical floods and damage estimates on the streams within the corporate limits of Thornton is sparse. The streams have caused overland inundation of

homes and streets, but no recorded discharges or damage estimates exist.

There are also areas in southeast Thornton which experience shallow sheetflow flooding from the South Platte River.

Major flooding in the Town of Bennett has been well documented back to 1875, where a major flood along Kiowa Creek overflowed the channel banks and destroyed the Town. After that flooding event, the Town was moved to its present day location.

2.4 Flood Protection Measures

The first tangible contribution to flood control affecting Adams County streams was made in 1890, when the Castlewood Dam, primarily intended for irrigation storage, was completed by the Denver Land and Water Company on Cherry Creek, 35 miles upstream from Denver in Douglas County. The dam, with a storage capacity of approximately 13,000 acre-feet, was mistakenly regarded by many as protection against deluges. In August 1933, the dam burst under pressure of water from severe thunderstorms in the upper Cherry Creek Basin. Flood control measures on Cherry Creek began in 1936 with the completion of the $800,000, 55-feet high Kenwood Dam, 5 miles from southeast Denver, near Sullivan, Colorado. Despite security, Kenwood Dam was not regarded as the complete answer to flood control on Cherry Creek; therefore, in 1950, the Cherry Creek Dam was constructed just upstream of Kenwood at a cost of $20 million. The dam, 14,300 feet wide and 140 feet high, now serves Denver as a park and water recreation area as well as a retarding barrier for floods much larger than the event of June 1965.

With a history of major flooding on the South Platte River through 1933, and with the culmination of planning, design, and construction of Cherry Creek Reservoir in 1950, the Denver metropolitan area saw an additional need for a flood control structure on the South Platte River just downstream of the Plum Creek confluence. During the 1950s, planning and design for the Chatfield Dam flood control reservoir was completed. At that time, however, funding was not available to initiate and complete construction. Three hundred million dollars in property damages suffered in 1965 flooding changed the minds of many and led to project funding and construction. In 1973, final closure of the dam was made, and the facility became capable of storing tributary floodwaters. Chatfield Dam is located approximately 0.5 mile above the City of Littleton, Colorado, in Douglas and Jefferson Counties.

In addition to the Cherry Creek, Mt. Carbon, and Chatfield Dams, one additional flood control measure, the Bear Creek Dam, was envisioned in the early 1940s. Authorization for funding and design of the dam did not occur until 1968. Construction on the $68 million earthfill structure was started in July 1974, and was completed in 1982. The dam is over 170 feet high and approximately 7,000 feed wide, having a storage capacity of 75,000 acre-feet.

Throughout the study segment of the South Platte River in Adams County, levees have also been constructed as a flood protection measure. However, past evidence

shows these levees to be ineffective against 1-percent-annual-chance floods. On large segments of the South Platte River, historical records indicate that the 1965 and 1973 floods were of the 1-percent-annual-chance magnitude or greater.

A major drainageway planning report has been completed for Big Dry Creek (Reference 20). That report designates various structural measures and nonstructural actions which would be appropriate to alleviate potential flood damage along this stream.

In the City of Federal Heights, a detention pond was constructed near Elm Court, at the upstream limit of study for Tributary M of Niver Creek. This pond is designated to attenuate the peak 1-percent-annual-chance flow from 226 cfs to 200 cfs.

Nonstructural measures of flood protection are also used to aid in the prevention of future flood damage. These are the result of regulations of the UDFCD, located in Denver, Colorado.

The City of Thornton has completed improvements on Niver Creek to reduce or eliminate future flood damages. The effects of these improvements were considered in the study for Thornton.

The City has also made improvements on the Northfield Creek (Hoffman Drainageway) which have alleviated potential flood damages. These improvements were considered in the study.

The other flood protection measures which are presently in existence are local floodplain management measures. The City of Thornton passed the Storm Drainage and Flood Control Ordinance, Ordinance No. 693, on July 28, 1975, which requires any new development to provide detention storage so that the runoff rate before and after anticipated development will not increase flows.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood-hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 1-percent-annual-chance flood in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions

existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the county.

Big Dry Creek

For Big Dry Creek, synthetically developed hydrographs were computed to determine potential flood magnitudes. The area was divided into 517 sub-basins, which ranged from 0.01 to 1 square mile. Hydrographs for each of the sub-basins were developed with the U.S. Environmental Protection Agency Storm Water Management Model (SWMM; Reference 90). The SWMM models were first developed for each of the tributary watersheds, and the main stem model was developed by linking the tributary outfalls together and routing the discharge hydrographs downstream in Big Dry Creek.

South Platte River

Data used in the hydrologic analyses include synthetically developed storm runoff records, and information from the USACE study of the South Platte River (Reference 21). These discharge profiles were keyed to the 1-percent-annual-chance flood values computed from the Denver and Henderson gaging records, which were adjusted for the regulating effects of Chatfield, Mt. Carbon, and Cherry Creek Reservoirs. The Denver gage operated from May to October 1889, from June to October 1890, and from July 1895 to the present. The Henderson gage has been in operation since 1926. Values above and below these gaging stations were based on the USACE analysis using their hydrologic computer model for the South Platte River (Reference 21). That study was revised to use the final versions of the discharge profiles, covering the segment downstream of the Henderson Gaging Station (Reference 22).

Little Dry Creek, Hidden Lake, Niver Creek, and Northfield Creek

For Little Dry Creek, Hidden Lake, Niver Creek, and Northfield Creek, synthetically developed hydrographs were computed to determine potential flood magnitudes. Rainfall data used in the development of these hydrographs were taken from the Denver Regional Council of Governments' Urban Storm Drainage Criteria Manual (USDCM) (Reference 23). Synthetic hydrograph procedures used in the study include the Colorado Urban Hydrograph Procedure (CUHP), outlined in the USDCM and the USACE HEC-1 Computer Hydrograph Package (Reference 24). The discharges computed for this stream varied only slightly from those computed in the previous study. Therefore, the original information was used.

Tributary M of Niver Creek

Peak discharges for the 10- and 1-percent-annual-chance floods for Tributary M of Niver Creek were developed using the CUHP (Reference 31) and USACE HEC-1 (Reference 24) computer models. The watershed was subdivided into six subbasins. For each subbasin, peak flow hydrographs were developed using the CUHP model. Parameters for the hydrograph development include rainfall data (Reference 32), soil type, land use, basin area, and basin geometry (References 33, 34, and 35). The outflow hydrographs derived for the subbasins were then used for the HEC-1 model, which was channel and storage routing capability using the Modified Puls methods.

The result from the HEC-1 analysis shows that the upper pond near Elm Circle attenuates the 1-percent-annual-chance peak flow from 226 cfs to 200 cfs. The flows vary from 200 cfs upstream to 1,086 cfs at Pecos Street.

Grange Hall Creek, Grange Hall Creek Northeast Tributary, Grange Hall Creek South Tributary, Basin 4100, and Brantner Gulch

Synthetically developed hydrographs were computed to determine the 10-, 2-, and 1-percent-annual-chance discharges. Rainfall data used in the development of these hydrographs were taken from the USDCM (Reference 36). The 0.2-percent-annual-chance discharge on all streams was obtained from a straight-line plot on log probability paper.

The 10-, 2-, and 1-percent-annual-chance values for Grange Hall Creek, Grange Hall Creek Northeast Tributary, and Grange Hall Creek South Tributary were provided by the UDFCD (Reference 37).

The 10-, 2-, and 1-percent-annual-chance values for Basin 4100 and Brantner Gulch were computed by the study contractor.

Tanglewood Creek

Since no stream gage data were available for Tanglewood Creek, a rainfall runoff analysis was conducted on the watershed to determine the flood discharges. This was accomplished by using the UDFCD CUHP rainfall-runoff computer program to develop the storm hydrographs (Reference 31) and the USACE HEC-1 flood hydrograph package computer program for the stream and reservoir routings (Reference 38). For the analysis, basin characteristics which define the size, shape and runoff characteristics of the watershed as well as rainfall amounts based on the selected recurrence intervals (obtained from the National Oceanic and Atmospheric Administration atlas of precipitation — Reference 32) are used to compute flood hydrographs for various design points in the basin. All stream and reservoir routings were accomplished using the Modified Puls Method.

Since there was a lack of 500-year precipitation data, the 500-year frequency storm runoff values at each design point were calculated. The logarithmic values of the 10-, 2-, and 1-percent-annual-chance peak discharges were fit to a regression line by method of least squares. The 0.2-percent-annual-chance discharges were analytically

extrapolated from the regression line based upon a log-normal probability relationship.

Box Elder Creek, Hayesmount Creek, Hayesmount Creek East Tributary, Hayesmount Creek West Tributary, Bear Gulch, and Bear Gulch Tributaries D, E and G

Peak discharges for Box Elder Creek, Hayesmount Creek, Hayesmount Creek East Tributary, Hayesmount Creek West Tributary, Bear Gulch, and Bear Gulch Tributaries D, E, and G were developed using the CUHPF/PC (Reference 83) and UDSWM 95 (Reference 84) computer programs. The watershed was subdivided into four major subwatersheds encompassing smaller subbasins. Parameters for each subbasin include rainfall data, soil type, land use, basin area, and basin geometry (Reference 23). The outflow hydrographs derived for the CUHP models were then routed downstream in UDSWM, which utilizes the kinematic wave rating approach.

Other Areas

For the larger drainage basins east of the Denver metropolitan area, discharge versus drainage area relationships were developed. These determinations were based on the standard log-Pearson Type III statistical analysis (Reference 25) of flood discharge records from several streams adjacent to the study area as well as in eastern Colorado. The discharge records for the steams considered covered periods from 10 to 74 years. The data used in making these determinations were recorded at 18 gaging stations by the USGS (References 27 and 29) and compared to the USACE Standard Project Flood data when available (References 12, 21, and 30).

Peak discharge-drainage area relationships for streams studied by detailed methods are shown in Table 3, "Summary of Discharges."

Table 3: Summary of Discharges

Flooding Source and Location	Drainage Area (Square miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
BASIN 4100					
At mouth	1.8	240	340	380	500
BEAR GULCH					
At confluence with Box Elder Creek	19.8	1,400	4,400	6,300	10,300
BEAR GULCH TRIBUTARY D					
At confluence with Bear Gulch	1.2	265	690	938	1,391
BEAR GULCH TRIBUTARY E					
At confluence with Bear Gulch	0.8	230	538	699	1,009
BEAR GULCH TRIBUTARY G					
At confluence with Bear Gulch	2.4	507	1,298	1,754	2,587
BIG DRY CREEK					
At 168th Avenue	66.6	4,530	8,260	10,000	13,460
Confluence with Morris Creek	56.8	4,590	8,350	10,060	13,400
3000 feet upstream of 160th Avenue	55.7	4,620	8,390	10,090	13,400
Confluence with Sack Creek	54.2	4,640	8,430	10,120	13,430
1000 feet downstream of E-470 Westbound Ramp	52.9	4,630	8,410	10,090	13,330
Upstream of confluence with Wadley North	52.8	4,670	8,460	10,130	13,330
Upstream of confluence with Mustang Run	50.3	4,660	8,440	10,100	13,280
Upstream of confluence with West Bijou Creek	48.0	4,680	8,470	10,120	13,260
At 144th Avenue	46.3	4,830	8,580	10,210	13,530
1000 feet upstream of 144th Avenue	45.0	4,870	8,620	10,230	13,440
At Washington Street	42.2	4,820	8,570	10,170	13,380
900 feet downstream of 136th Avenue	41.7	4,720	8,420	10,000	12,990
At 136th Avenue	41.0	4,730	8,410	9,970	12,930

Table 3: Summary of Discharges (continued)

Flooding Source and Location	Drainage Area (Square miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
BIG DRY CREEK (CONTINUED)					
350 feet downstream of confluence with Tanglewood Creek	39.7	4,700	8,360	9,920	12,830
Upstream of confluence with Tanglewood Creek	34.5	4,640	8,280	9,760	12,630
Upstream of confluence with Quail Creek	33.6	4,510	7,930	9,220	11,690
At Willow Run Parkway	32.5	4,460	7,860	9,130	11,640
BOX ELDER CREEK					
At 168th Avenue	243.0	1,100	7,400	11,500	20,600
Downstream of confluence with Bear Gulch	227.0	1,100	6,900	10,400	17,600
Upstream of the confluence with Bear Gulch	207.0	1,000	5,600	8,900	15,300
At Interstate 70	202.0	1,246	5,741	9,140	15,618
BRANTNER GULCH					
At the City of Thornton Corporate Limits	1.3	480	720	830	1,100
CLEAR CREEK					
At South Platte Confluence	*	*	*	23,100	*
At Interstate 76	*	*	*	10,079[1]	*
At Sheridan Boulevard Bridge	*	*	*	20,590	*
CLEAR CREEK NORTH OVERFLOW					
At Lowell Street	*	*	*	11,609	*
COMANCHE CREEK					
At Weld County Line	245.2	*	*	48,864[2]	*
Below confluence with Wolf Creek	224.3	*	*	23,187	*

* Data Not Available

[1] Reflects flow spills to Clear Creek North Overflow

[2] Includes discharge from Kiowa Creek

Table 3: Summary of Discharges (continued)

Flooding Source and Location	Drainage Area (Square miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
COMANCHE CREEK (CONTINUED)					
Above confluence with Wolf Creek	124.0	*	*	12,049	*
At 26th Avenue	94.4	1,103	4,773	9,640[1]	12,704
At Adams/Arapahoe County Limit (U.S. Highway 36)	84.0	1,000	2,400[2]	4,112[2]	6,618[2]
COMANCHE CREEK RT. BANK OVERFLOW					
Just downstream of 56th Avenue	*	-[3]	-[3]	4,996	-[3]
At U.S. Highway 36	*	-[4]	-[4]	1,500	-[3]
COYOTE RUN					
At Interstate 70/U.S. Highway 36	17	1,680	4,960	6,940	10,800
GRANGE HALL CREEK					
At Riverdale Road	7.1	1,700	2,067	2,214	2,600
At Colorado Boulevard	6.3	1,616	1,798	1,943	2,000
Downstream of confluence with Grange Hall Creek North Tributary	4.7	1,058	1,161	1,204	1,600
Downstream of confluence with Grange Hall Creek South Tributary	3.4	1.166	1,582	1,769	2,200
Downstream of Washington Street Pond	1.3	642	868	976	1,200
At Washington Street Pond	1.3	957	1,195	1,283	1,450
GRANGE HALL CREEK NORTH TRIBUTARY					
At confluence with Grange Hall Creek	1.1	490	539	560	600

* Data not available

[1] Upstream of 26th Avenue, 275 cfs overtops into Comanche Creek Overflow

[2] Just upstream of Highway 36, discharge from Comanche Creek and Little Comanche Creek converge and then split at Highway 36

[3] Not computed for overflow

[4] 10-percent and 2-percent contained in channel of Little Comanche Creek and Comanche Creek

Table 3: Summary of Discharges (continued)

Flooding Source and Location	Drainage Area (Square miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
GRANGE HALL CREEK NORTHEAST TRIBUTARY					
At Mouth	1.2	644	865	959	1,200
At 112th Avenue	1.1	594	799	887	1,140
Downstream Union Pacific Railroad	0.6	466	635	693	900
GRANGE HALL CREEK SOUTH TRIBUTARY					
At Mouth	1.7	639	797	856	1,100
HAYESMOUNT CREEK					
At 168th Avenue	30.4	530	1,600	2,400	3,900
HAYESMOUNT CREEK EAST TRIBUTARY					
At confluence with Hayesmount Creek	5.4	290	863	1,247	2,038
HAYESMOUNT CREEK WEST TRIBUTARY					
At confluence with Hayesmount Creek	6.8	477	1,469	2,109	3,322
LITTLE COMANCHE CREEK					
At U.S. Highway 36	10.4	500	2,400[1]	5,800[1]	6,618[1]
LITTLE DRY CREEK					
At confluence with Clear Creek	13.1	2,200	3,030	3,370	4,200
Downstream of Federal Boulevard	12.2	2,160	2,950	3,270	4,000
Upstream of Federal Boulevard	12.2	2,590	3,430	3,790	4,630
NIVER CREEK					
At confluence with South Platte River	6.6	1,850	2,860	3,250	4,350
At York Street	6.3	1,800	2,780	3,150	4,260
At North Washington Street	5.4	1,450	2,160	2,760	3,900

[1] Reflects flow spills to Clear Creek North Overflow

Table 3: Summary of Discharges (continued)

Flooding Source and Location	Drainage Area (Square miles)	Peak Discharges (Cubic Feet per Second) 10-percent	2-percent	1-percent	0.2-percent
NORTHFIELD CREEK					
At Union Pacific Railroad	1.2	680	1,050	1,240	1,850
At East 88th Avenue	0.8	490	580	680	1,000
SAND CREEK					
At confluence with S. Platte River	196.0	11,000	24,200	30,500	36,200
At Quebec Street	189.0	10,500	23,300	30,000	33,000
SOUTH PLATTE RIVER [1]					
At confluence with Todd Creek	5,026.0	11,400	25,500	33,600	59,450
At confluence with Clear Creek	4,572.0	12,700	27,500	37,600	66,710
TANGLEWOOD CREEK					
At confluence w/ Big Dry Creek	1.12	340	758	934	1,655
At upstream Study Limit	0.11	105	217	253	424
TRIBUTARY M OF NIVER CREEK					
At Pecos Street	0.92	490	*	1,050	*
At Bryant Drive	0.49	450	*	925	*
At upstream Limit of Study Near Elm Circle	0.18	88	*	200	*
WOLF CREEK					
Above confluence with Comanche Creek	100.3	*	*	12,408	*

* Data not available

[1] Assuming Chatfield and Cherry Creek Dam Gates closed when flow at gage reached 5,000 cfs

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM.

The hydraulic analysis for Big Dry Creek was performed using the United States Corps of Engineers Hydrologic Engineering Center's River Analysis System, or HEC-RAS, version 4.0 (Reference 91). Cross section data was obtained from previous Flood Hazard Area Delineation studies from 1986/1988 (Reference 92) and revised using 2008 LiDAR topography with 2-ft contour intervals (Reference 94). Channel roughness factors (Manning's "n") for these computations were determined through field observations and typically ranged from 0.030 to 0.045 within the channel banks and 0.050 to 0.060 in the overbank areas. Starting water surface elevations were computed using step-backwater with normal depth as the starting condition.

Unless otherwise noted, for all streams studied by detailed methods, the water-surface elevations for floods of the selected recurrence intervals were computed using the USACE HEC-2 step-backwater computer program (Reference 39).

Little Dry Creek, Northfield Creek, and Niver Creek

Cross section data for Little Dry Creek, Northfield Creek, and Niver Creek were field surveyed and were located at close intervals above and below culverts, bridges, and drop structures in order to compute the effects of backwater. When necessary, USGS topographic maps at a scale of 1:24,000, with a contour interval of 10 feet (Reference 34) were used to supplement the field-surveyed data.

Channel roughness factors (Manning's "n") for these computations were assigned on the basis of field inspection of the floodplain areas and engineering judgment. Bridge geometry and elevation information was obtained from the Colorado State Highway Department, when available, or measured in the field.

Starting water-surface elevations for the tributaries of the South Platte River were taken from previously computed stage-discharge relationships when available (Reference 21). In many cases, control elevations were shifted upstream to bridges or culverts. Where no other information or control structures were available, the starting water-surface elevations were computed by the slope-area method option of the HEC-2 program (Reference 39).

These analyses indicate that flood flow from Little Dry Creek is divided into two flow paths in the area downstream of the Colorado and Southern Railroad crossing. The Little Dry Creek profiles show the individual elevations for both of these separate flow paths.

Flooding from Northfield Creek above Devonshire Boulevard does not necessarily follow the natural stream channel. For this area, flood profiles were developed using hydraulic flow lines, labeled as base line of flow on the maps and profiles.

The reach of Sand Creek between Vasquez and Brighton Boulevards within Commerce City was revised to reflect a hydraulic analysis carried out by Simons, Li and Associates, Inc., based on new topographic information (Reference 41).

Tributary M of Niver Creek

Cross sections for the backwater analyses for Tributary M of Niver Creek were obtained from topographic maps, provided by the City, at a scale of 1:1,200, with a contour interval of 2 feet (Reference 35). All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the stream and floodplain areas. Roughness values for the main channel ranged from 0.02 to 0.04, and overbank roughness values ranged from 0.02 to 0.07.

The starting water-surface elevation was derived from hand computations for the peak flow at Pecos Street. The computation derived rating curves for pressure and weir flow at Pecos Street crossing. The culverts at Holiday Glen and Holiday Circle were included in the HEC-2 models. However, three long culverts that have limited capacity of fully contain the 10- and 1-percent-annual-chance peak flows were not included. These culverts extend from the east branch of Holiday Circle to 100 feet downstream of Holiday Vale; from the east branch of Holiday Terrace downstream 200 feet; and from Holiday Parkway downstream 200 feet. The culvert under Holiday Parkway is submerged due to backwater from Pecos Street for the 10- and 1-percent-annual-chance floods.

Grange Hall Creek, Grange Hall Creek Northeast Tributary, Grange Hall Creek South Tributary, Basin 4100, and Brantner Gulch

Cross section data for Grange Hall Creek, Grange Hall Creek Northeast Tributary, and Grange Hall Creek South Tributary were taken from aerial mapping at a scale of 1:6,000, with a contour interval of 2 feet (Reference 42). The cross section information on Basin 4100 and Brantner Gulch was obtained by field measurements. Field measurements were also taken to obtain elevation data and structural geometry of all bridges and culverts.

Roughness coefficients (Manning's "n") were estimated by field inspection. Values used ranged from 0.025 to 0.040 for the channel and from 0.035 to 0.070 for the overbank.

Starting water-surface elevations were determined for Brantner Gulch by normal depth analysis and for Basin 4100 by inspection of the culvert at the downstream study limit.

The water-surface elevations for Grange Hall Creek and tributaries were computed using a step-backwater model similar to HEC-2, developed by the USACE (Reference 39). The starting water-surface elevations were provided by the UDFCD (Reference 37).

Tanglewood Creek

Cross sections used in the backwater analyses were obtained by aerial photogrammetry (Reference 43). The below water sections of all cross sections were obtained by field measurement. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Roughness factors (Manning's "n") used in the hydraulic computations for the study areas were chosen by engineering judgment and based on field observations of the flooding sources and floodplain areas. Roughness values for the main channels of the streams studied range from 0.020 to 0.065 with floodplain roughness values ranging form 0.020 to 0.100.

Starting water-surface elevations were based on hand calculations at control sections; obtained by the slope area method, or determined for a tributary to a major stream from the major stream at concurrent flows.

Niver Creek, Tributary L of Niver Creek, Tributary M of Niver Creek, and Northfield Creek

In the City of Federal Heights, an approximate floodplain analysis was carried out for Niver Creek and Tributary L of Niver Creek using assumed depths based on a review of the Tributary M profile and available hydrologic information, extensive field reconnaissance, and engineering judgment.

Through the City of Thornton, the approximate 1-percent-annual-chance flood elevation of Niver Creek and Tributaries L and M were based on the Phase B report, Water and Drainage at Niver Creek (Reference 44), and supplemental data provided by the City of Thornton. The approximate 1-percent-annual-chance flood elevations along Northfield Creek (Hoffman Drainageway) were based on the Interim Drainage Study of Hoffman Way (Reference 45), the Adams County FIS (Reference 2), and additional data provided by the engineering department of the City of Thornton.

Hidden Lake

Approximate 1-percent-annual-chance flooding along portions of Hidden Lake Drainageway was taken from the UDFCD study for that drainage system (Reference 46). For the remaining approximate studies, elevations were determined by normal depth calculations using approximate cross sections taken from USGS maps (Reference 34).

South Platte River

Cross-section data for the hydraulic analysis along the South Platte River were obtained from 2-foot contour mapping, provided by Adams County, and supplemented with field survey cross-sections obtained by Camp Dresser & McKee, Inc. and the UDFCD (Reference 85). Roughness factors were based on current field information in addition to roughness factors used in previous hydraulic modeling studies for the South Platte River (Reference 86). Water surface elevations for the selected recurrence intervals along the

South Platte River were developed using the USACE River Analysis System computer program (Reference 87). Split flow and divided flow were considered in the hydraulic analysis of the South Platte River.

In several reaches of the study area, embankments adjacent to the main channel act as levees. Since the stability of these embankments is unknown, and they are not certified by the USACE, the levees were modeled both as intact and as failing in order to determine the water surface elevations along the main channel at overbank areas accordingly.

Box Elder Creek, Hayesmount Creek, Hayesmount Creek East Tributary, Hayesmount Creek West Tributary, Bear Gulch, and Bear Gulch Tributaries D, E, and G

Cross-sections for Box Elder Creek, Hayesmount Creek, Hayesmount Creek East Tributary, Hayesmount Creek West Tributary, Bear Gulch, and Bear Gulch Tributaries D, E, and G were obtained from digital mapping provided by the UDFCD (Reference 88), at a map scale of 1" = 200-feet and a contour interval of 2-feet. Roughness coefficients were determined through field observation, review of the USACE recommended values, and consultation with UDFCD staff. For Hayesmount Creek, roughness coefficients ranged from 0.035 to 0.06, and the overbank roughness values were generally 0.035 for both the channel and overbanks, except in areas of significant vegetation, where the channel roughness value was increased to 0.04. Water surface elevations for the selected recurrence intervals was developed using the USACE River Analysis System computer program (Reference 87).

Comanche Creek, Little Comanche Creek, and Wolf Creek

Water surface elevations of floods of the selected recurrence intervals were developed using the USACE River Analysis System computer program (Reference 87) for Comanche Creek, Little Comanche Creek, and Wolf Creek.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which floodway was computed (Section 4.2), selected cross section locations are also shown on the FIRM (Exhibit 2).

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the completion of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are now prepared using NAVD as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to the NAVD88. It is important to note that adjacent counties may be referenced to NGVD29. This may result in differences in base flood elevations across the corporate limits between communities.

As noted above, the elevations shown in the FIS report and on the FIRM for Adams County and Incorporated Areas are referenced to NAVD88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD29 by applying a standard conversion factor.

The conversion from NGVD29 to NAVD88 ranged between 2.60 and 3.06 for this county. Accordingly, due to the range in conversion factors, an average conversion factor was established for the entire county. The elevations shown in the FIS report and on the FIRM were, therefore, converted to NAVD88 using a countywide approach in which an average conversion was established for the county. The conversion factor for NGVD 29 to NAVD 88 of +2.87 feet was used for each flooding source in the community.

The BFEs shown in the FIRM represent whole-foot rounded values. For example, a BFE of 5202.4 will appear as 5202 on the FIRM and 5202.6 will appear as 5203. Therefore, users who wish to convert the elevations in this FIS to NGVD29 should apply the stated conversion factor to elevations shown on the Flood Profiles and supporting data tables in the FIS report, which are shown at a minimum to the nearest 0.1 foot.

For more information on NAVD88, see the publication entitled, Converting the National Flood Insurance Program to the North American Vertical Datum of 1988 (FEMA Publication FIA-20/June 1992), or contact the Vertical Network Branch, National Geodetic Survey, Coast and Geodetic Survey, National Oceanic and Atmospheric Administration, Rockville, Maryland 20910 (Internet address http://www.ngs.noaa.gov).

Qualifying bench marks within a given jurisdiction that are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS) as First or Second Order Vertical and have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Bench marks catalogued by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position/elevation well (e.g., mounted in bedrock)

- Stability B: Monuments which generally hold their position/elevation well (e.g., concrete bridge abutments)

- Stability C: Monuments which may be affected by surface ground movements (e.g., concrete monument below frost line)

- Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line or steel witness post)

To obtain up-to-date elevation information on NGS bench marks shown on the FIRM, please contact the Information Services Branch of the NGS at (301) 7133242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS monument elevations when using these elevations for construction or floodplain management purposes.

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and FIRM for this community. Interested individuals may contact FEMA to access these data.

For information on additional control points maintained by Adams County that are not shown on the FIRM, please visit www.co.adams.co.us.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. To assist in this endeavor, each FIS report provides 1-percent-annual-chance floodplain data, which may include a combination of the following: 10-, 2-, 1-, and 0.2-percent-annual-chance flood elevations; delineations of the 1- and 0.2-percent-annual-chance floodplains; and a 1-percent-annual-chance floodway. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, Floodway Data tables, and Summary of Stillwater Elevation tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed or limited detailed methods, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section.

Between cross sections, the boundaries were interpolated using topographic maps at scales of 1:24,000; 1:2,400; 1:6,000; and 1:1,200; with contour intervals of 10 and 2 feet (References 34, 35, 40, 42, 43, 47, and 48).

The 1- and 0.2-percent-annual-chance floodplain boundaries for streams studied by detailed methods are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones AH, AO, AR and A99), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1-and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain

boundaries may lie above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 1-percent-annual-chance floodplain boundary is shown on the FIRM (Exhibit 2).

Within the City of Commerce City, areas of shallow sheet flow outside the aerial photo mapping limits were delineated using a topographic map at a scale of 1:24,000, with a contour interval of 10 feet (Reference 34).

Approximate 1-percent-annual-chance floodplain boundaries within the City of Federal Heights were delineated using topographic maps at a scale of 1:1,200, with a contour interval of 2 feet (Reference 49).

Approximate 1-percent-annual-chance floodplain boundaries in some portions of the study area were taken directly from the Flood Hazard Boundary Map for the City of Thornton (Reference 50).

Approximate flood boundaries in some portions of the City of Northglenn were taken from the FIA's Flood Hazard Boundary Map (Reference 51); others were taken from USGS Flood Prone Area Maps (Reference 52).

For streams studied by approximate methods in other areas of Adams County, the boundaries of the 1-percent-annual-chance flood were delineated using the determined elevations and topographic maps (Reference 34), and were reconciled with USGS Flood Prone Area Maps (Reference 52), and concurrent studies completed on Second and Third Creeks for the UDFCD (Reference 53). The boundary of the 1-percent-annual-chance flood for portions of Hidden Lake Drainageway was taken from the UDFCD study for that drainage system (Reference 46).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the base flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The City of Brighton, the City of Thornton, and Adams County have ordinances which limit the increase in flood heights to 0.5 foot above the pre-floodway elevation; therefore

floodways having no more than a 0.5-foot surcharge have been delineated for these communities.

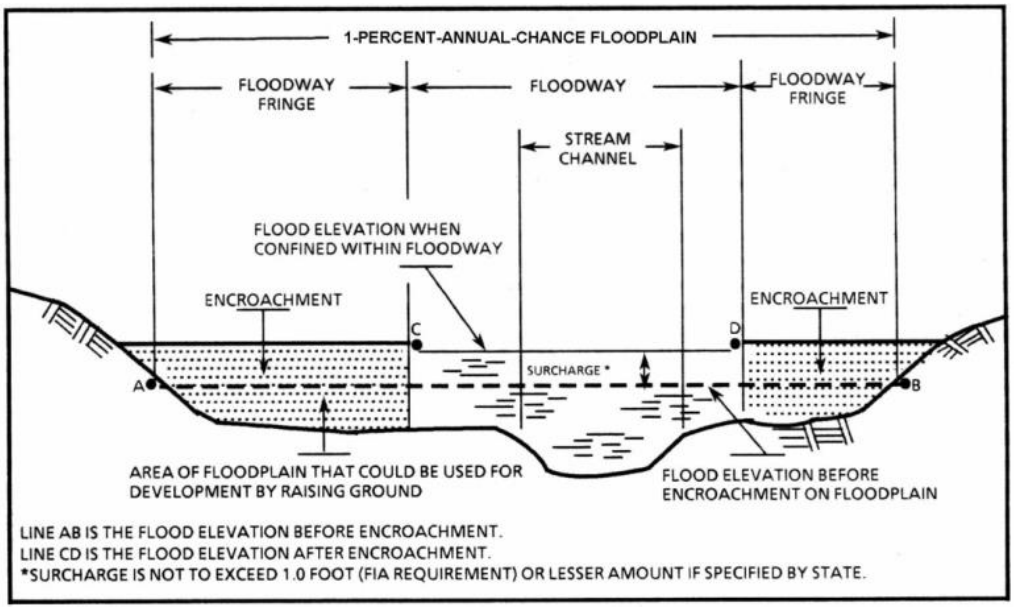
Floodways were not computed along Tributary M of Niver Creek through the City of Federal Heights because they were not within the scope of this study.

The floodways presented in this study were computed for certain stream segments on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and provided in Table 4, "Floodway Data." The computed floodway is shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown on the FIRM.

Portions of the floodway for Big Dry Creek extend beyond the county limits for Adams County identified in this FIS report.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation (WSEL) of the base flood more than 1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1.

Figure 1. Floodway Schematic



FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BASIN 4100								
A	1,260	50	50	7.0	5,094.5	5,094.5	5,094.5	0.0
B	1,675	50	98	3.6	5,102.6	5,102.6	5,102.6	0.0
C	2,080	80	52	6.2	5,104.6	5,104.6	5,104.6	0.0
D	3,000	60	159	2.0	5,108.0	5,108.0	5,108.0	0.0
E	3,150	60	117	2.4	5,108.7	5,108.7	5,108.7	0.0
F	3,270	60	197	1.4	5,111.7	5,111.7	5,111.7	0.0
G	4,180	140	77	3.1	5,129.1	5,129.1	5,129.1	0.0
H	4,760	20	35	6.8	5,138.8	5,138.8	5,139.1	0.3
I	4,800	10	31	7.8	5,139.2	5,139.2	5,139.5	0.3
J	5,270	40	47	4.5	5,145.1	5,145.1	5,145.6	0.5
K	5,360	540	3,465	0.2	5,159.9	5,159.9	5,160.4	0.5
L	6,130	110	480	1.6	5,159.9	5,159.9	5,160.4	0.5
M	6,490	75	105	6.3	5,160.4	5,160.4	5,160.4	0.0
N	7,240	40	36	6.3	5,176.0	5,176.0	5,176.0	0.0
O	8,060	85	41	4.5	5,180.4	5,180.4	5,180.4	0.0
P	8,560	50	52	4.4	5,186.6	5,186.6	5,186.6	0.0
Q	9,100	40	35	5.2	5,198.2	5,198.2	5,198.2	0.0
R	9,200	90	45	4.0	5,212.0	5,212.0	5,212.0	0.0
S	9,800	100	115	1.6	5,214.5	5,214.5	5,214.5	0.0
T	10,000	220	39	4.7	5,223.2	5,223.2	5,223.2	0.0

[1] Feet above mouth

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Basin 4100

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BEAR GULCH								
A	1,533	180	875	7.2	5,284.1[2]	5,283.0	5,283.6	0.6
B	3,834	301	1,344	4.7	5,285.4	5,285.4	5,286.0	0.6
C	5,613	190	812	7.7	5,286.6	5,286.6	5,286.8	0.2
D	8,561	360	723	8.0	5,289.7	5,289.7	5,290.0	0.3
E	11,012	229	899	6.3	5,296.1	5,296.1	5,296.7	0.6
F	12,931	236	996	5.3	5,303.4	5,303.4	5,304.2	0.8
G	14,754	330	925	5.7	5,307.3	5,307.3	5,307.9	0.6
H	17,474	375	1,108	4.4	5,316.0	5,316.0	5,316.8	0.8
I	19,081	655	1,272	3.7	5,323.0	5,323.0	5,323.9	0.9
J	21,073	200	687	6.8	5,329.8	5,329.8	5,330.4	0.6
K	23,852	202	609	6.6	5,339.7	5,339.7	5,340.6	0.9
L	25,987	216	537	7.3	5,349.3	5,349.3	5,349.8	0.5
M-O[3]	-	-	-	-	-	-	-	-
P	33,268	170	1,322	2.3	5,388.2	5,388.2	5,389.1	0.9
Q-U[3]	-	-	-	-	-	-	-	-
V	45,489	47	178.0	10.5	5,490.8	5,490.8	5,490.8	0.0
W	46,544	51	143.0	9.4	5,508.2	5,508.2	5,508.6	0.4
X	47,850	[3]	[3]	[3]	5531.7	[3]	[3]	[3]

[1]Feet above confluence with Box Elder Creek

[2]Flooding controlled by Box Elder Creek

[3]Data Not Available

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

BEAR GULCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BEAR GULCH TRIBUTARY D								
A[2]	-	-	-	-	-	-	-	-
B	1,275	207	224	6.1	5,412.5	5,412.5	5,413.2	0.7
C	2,410	214	237	4.0	5,425.1	5,425.1	5,425.9	0.8

[1] Feet above confluence with Bear Gulch
[2] Cross sections are outside of Adams County

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Bear Gulch Tributary D

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BEAR GULCH TRIBUTARY E A	1,115	123	130	6.9	5,389.9	5,389.9	5,390.3	0.4

[1] Feet above confluence with Bear Gulch

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Bear Gulch Tributary E

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BEAR GULCH TRIB G								
A	1,080	834	711	3.8	5,338.4	5,338.4	5,339.4	1.0
B	2,496	445	367	7.1	5,348.3	5,348.3	5,348.8	0.5
C	4,442	186	286	7.0	5,360.3	5,360.3	5,360.7	0.4

[1] Feet above confluence with Bear Gulch

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Bear Gulch Tributary G

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BIG DRY CREEK								
A	51,704	661	1,998	5.0	5048.5	5048.5	5048.8	0.3
B	52,362	557	1,833	5.5	5050.0	5050.0	5050.1	0.1
C	54,164	914	2,486	4.0	5053.5	5053.5	5053.6	0.1
D	56,391	1,284	3,229	3.1	5059.1	5059.1	5059.1	0.0
E	60,579	2,301	37,505	0.3	5082.5	5082.5	5082.5	0.0
F	62,978	1,776	22,215	0.5	5082.5	5082.5	5082.5	0.0
G	65,921	1,346	7,824	1.3	5082.6	5082.6	5082.6	0.0
H	70,375	528	1,838	5.5	5090.8	5091.1	5091.1	0.3
I	75,879	910	4,588	2.2	5103.0	5103.0	5103.1	0.1
J	80,399	663	2,673	3.8	5111.3	5111.3	5111.4	0.1
K	86,029	639	2,451	4.1	5123.1	5123.1	5123.4	0.3
L	89,954	491	2,019	5.1	5132.6	5132.6	5133.0	0.4
M	93,575	430	1,683	6.1	5141.0	5141.0	5141.2	0.2
N	95,857	1,132	3,047	3.3	5146.3	5146.3	5146.7	0.4
O	97,873	752	1,977	5.0	5154.2	5154.2	5154.4	0.2
P	100,394	340	1,657	5.9	5162.9	5162.9	5162.9	0.0
Q	111,952	428	2,161	4.2	5195.5	5195.5	5196.0	0.5

[1] Feet above confluence with South Platte River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Big Dry Creek

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Box Elder Creek								
A	193,597	941	4,665	3.5	5,058.9	5,058.9	5,059.3	0.4
B	195,951	827	2,567	4.9	5,063.4	5,063.4	5,063.6	0.2
C	197,041	550	1,597	7.8	5,065.9	5,065.9	5,066.1	0.2
D	198,229	759	2,353	5.3	5,070.8	5,070.8	5,071.0	0.2
E	199,212	725	1,711	7.3	5,072.9	5,072.9	5,073.1	0.2
F	200,806	1,075	3,529	3.7	5,093.9	5,093.9	5,094.0	0.1
G	202,932	695	2,257	5.6	5,098.9	5,098.9	5,099.0	0.1
H	204,830	1,184	2,530	5.0	5,104.0	5,104.0	5,104.2	0.2
I	206,878	1,055	4,812	5.5	5,114.2	5,114.2	5,114.2	0.0
J	209,071	716	2,792	4.5	5,116.3	5,116.3	5,116.6	0.3
K	210,827	1,133	3,126	4.0	5,120.3	5,120.3	5,120.4	0.1
L	211,854	749	3,049	4.1	5,125.7	5,125.7	5,125.7	0.0
M	213,862	990	3,082	4.1	5,130.6	5,130.6	5,130.7	0.1
N	215,738	710	2,077	6.1	5,134.0	5,134.0	5,134.1	0.1
O	218,990	810	2,679	4.7	5,141.4	5,141.4	5,141.6	0.2
P	221,016	727	2,640	4.8	5,147.5	5,147.5	5,147.5	0.0
Q	222,317	705	2,595	4.9	5,151.1	5,151.1	5,151.2	0.1
R	224,146	715	2,863	4.4	5,157.2	5,157.2	5,157.4	0.2
S	225,733	890	3,746	3.4	5,161.0	5,161.0	5,161.3	0.3
T	227,675	672	1,885	6.7	5,165.7	5,165.7	5,165.7	0.0
U	229,098	655	2,648	4.8	5,173.3	5,173.3	5,173.4	0.1

[1]Feet above confluence with South Platte River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

BOX ELDER CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Box Elder Creek								
V	230,171	535	2,168	5.9	5,175.8	5,175.8	5,175.9	0.1
W	231,496	699	2,820	4.5	5,181.2	5,181.2	5,181.5	0.3
X	232,627	912	3,929	3.2	5,183.5	5,183.5	5,183.6	0.1
Y	235,511	660	2,242	9.0	5,195.8	5,195.8	5,195.9	0.1
Z	235,662	1,414	6,900	4.2	5,199.2	5,199.2	5,199.2	0.0
AA	237,341	671	3,074	4.2	5,201.8	5,201.8	5,201.8	0.0
AB	239,954	774	2,091	6.1	5,208.2	5,208.2	5,208.3	0.1
AC	242,051	270	1,129	11.3	5,216.2	5,216.2	5,216.2	0.0
AD	242,664	379	2,242	5.7	5,220.4	5,220.4	5,220.6	0.2
AE-AJ[2]								
AK	253,306	534/182[3]	2,423	5.3	5,256.6	5,256.6	5,256.6	0.0
AL	254,204	1,104/546[3]	3,319	3.9	5,259.6	5,259.6	5,259.6	0.0
AM	258,383	1,348	1,501	7.5	5,267.1	5,267.1	5,267.2	0.1
AN	260,579	1,920	3,962	2.8	5,275.9	5,275.9	5,276.0	0.1
AO	263,188	985/393[4]	2,028	5.5	5,284.1	5,284.1	5,284.1	0.0
AP	263,664	561/211[4]	2,748	4.1	5,285.8	5,285.8	5,285.8	0.0
AQ	265,296	1,150	2,780	4.0	5,295.0	5,295.0	5,295.0	0.0
AR	267,707	598	1,986	9.1	5,302.7	5,302.7	5,302.7	0.0
AS	268,305	674	4,246	4.1	5,308.5	5,308.5	5,308.5	0.0
AT	268,900	391	2,216	5.1	5,309.5	5,309.5	5,309.5	0.0
AU	271,089	608	1,970	5.7	5,315.0	5,315.0	5,315.3	0.3

[1]Feet above confluence with South Platte River

[2]Cross Sections are outside of Adams County

[3]Total floodway width/width within jurisdiction

[4]Modeled includes Box Elder/Bear Gulch floodway

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

BOX ELDER CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Box Elder Creek								
AV	272,990	605	1,951	5.7	5,322.0	5,322.0	5,322.4	0.4
AW	274,475	1,034/219[3]	2,241	5.0	5,328.7	5,328.7	5,328.9	0.2
AX-BB[2]								
BC	282,442	966	3,587	3.8	5,360.7	5,360.7	5,360.9	0.2
BD-BR[2]								
BS	297,514	939/811[3]	2,100	5.3	5,423.8	5,423.8	5,423.8	0.0
BT	300,100	904	2,053	5.4	5,435.2	5,435.2	5,435.2	0.0
BU	301,791	1,507/1,061[3]	2,539	4.4	5,441.5	5,441.5	5,441.5	0.0
BV-CG[2]								
CH	316,634	1,022/619[3]	2,049	5.4	5,505.1	5,505.1	5,505.1	0.0
CI	317,980	889/609[3]	2,228	5.0	5,512.4	5,512.4	5,512.4	0.0
CJ	319,349	781	2,192	5.1	5,518.9	5,518.9	5,518.9	0.0
CK	320,889	1,364	2,679	4.8	5,525.6	5,525.6	5,525.6	0.0
CL	322,297	3,239/127[3]	5,281	3.6	5,532.5	5,532.5	5,532.5	0.0
CM	322,931	3,151/363[3]	4,550	4.3	5,534.8	5,534.8	5,534.8	0.0
CN	323,521	2,585/468[3,4]	5,443	4.0	5,537.8	5,537.8	5,537.8	0.0
CO	324,137	1,924/348[3]	4,216	5.9	5,540.9	5,540.9	5,540.9	0.0

[1]Feet above confluence with South Platte River

[2]Cross Sections are outside of Adams County

[3]Total floodway width/width within jurisdiction

[4]Width excludes dry ground between encroachments

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

BOX ELDER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BRANTNER GULCH								
A	0	150	116	7.2	5,157.2	5,157.2	5,157.2	0.0
B	1,360	150	136	5.5	5,172.7	5,172.7	5,172.7	0.0
C	2,300	131	143	5.2	5,185.4	5,185.4	5,185.4	0.0
D	2,500	141	131	5.7	5,189.6	5,189.6	5,189.6	0.0
E	2,535	206	162	4.1	5,192.2	5,192.2	5,192.2	0.0

[1] Feet above county boundary

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Brantner Gulch

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CLEAR CREEK								
A	175	1,424	4,424	6.4	5,101.4	5,101.4	5,101.4	0.0
B	1,401	695	3,016	7.7	5,107.6	5,107.6	5,107.5	0.0
C	2,829	350	2,289	10.1	5,115.0	5,115.0	5,115.1	0.1
D	3,355	283	2,986	7.7	5,118.9	5,118.9	5,119.4	0.5
E	4,839	450	4,909	4.7	5,127.1	5,127.1	5,127.6	0.5
F	6,094	550	5,202	4.4	5,131.6	5,131.6	5,132.0	0.4
G	7,357	670	5,053	4.6	5,134.4	5,134.4	5,134.6	0.2
H	8,349	573	5,070	4.6	5,136.0	5,136.0	5,136.1	0.1
I	9,445	572	6,772	3.4	5,143.7	5,143.7	5,143.7	0.0
J	11,354	403	4,192	5.5	5,152.1	5,152.1	5,152.1	0.0
K	12,509	1,139	9,551	2.4	5,159.6	5,159.6	5,159.6	0.0
L	14,989	639	8,635	2.7	5,161.4	5,161.4	5,161.4	0.0
M	17,784	525	2,961	7.8	5,183.3	5,183.3	5,184.3	1.0
N	18,691	700	3,236	7.1	5,188.0	5,188.0	5,188.8	0.8
O	19,799	780	5,268	4.4	5,191.8	5,191.8	5,192.8	1.0
P	20,684	700	4,534	4.5	5,199.6	5,199.6	5,200.5	0.9
Q	22,312	722	4,345	4.7	5,202.5	5,202.5	5,203.3	0.8
R	24,313	1,193	5,239	3.9	5,213.0	5,213.0	5,212.9	0.0
S	25,117	240	3,324	5.1	5,217.3	5,217.3	5,217.7	0.4
T	26,067	425	5,386	3.8	5,220.8	5,220.8	5,221.0	0.2
U	28,113	181	1,092	8.2	5,222.3	5,222.3	5,222.6	0.3
V	28,963	628	3,467	2.9	5,233.7	5,233.7	5,233.6	0.0
W	30,513	705	2,086	4.8	5,235.4	5,235.4	5,235.7	0.3
X	31,873	209	1,130	8.9	5,246.7	5,246.7	5,247.0	0.3
Y	32,497	185	963	10.5	5,248.7	5,248.7	5,249.7	1.0
Z	33,571	165	989	11.3	5,253.9	5,253.9	5,253.9	0.0

[1] Feet above mouth

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Clear Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CLEAR CREEK NORTH OVERFLOW								
A	451	673	2,072	5.6	5,224.3	5,224.3	5,225.3	1.0
B	1,042	919	2,301	4.6	5,231.2	5,231.2	5,231.3	0.1
C	2,083	691	1,337	7.9	5,233.0	5,233.0	5,233.9	0.9
D	3,113	691	3,091	3.4	5,239.5	5,239.5	5,240.5	1.0
E	3,619	911	2,157	4.9	5,245.0	5,245.0	5,246.0	1.0
F	4,653	1,164	5,848	1.8	5,250.5	5,250.5	5,251.5	1.0
G	5,385	839	4,695	2.0	5,250.6	5,250.6	5,251.6	1.0
H	5,910	861	4,886	1.2	5,250.7	5,250.7	5,241.7	1.0

[1] Feet above mouth

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Clear Creek North Overflow

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
COMANCHE CREEK								
W	113,103	527	1,155	8.0	5,345.8	5,345.8	5,345.9	0.1
X	114,366	1,319	2,127	4.3	5,352.2	5,352.2	5,352.6	0.4
Y	115,842	194	940	10.5	5,359.7	5,359.7	5,359.9	0.2
Z	117,432	439	685	6.3	5,367.7	5,367.7	5,367.7	0.0

[1] Feet above county boundary
Note: Comanche Creek A-V Floodway not computed.

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Comanche Creek

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Coyote Run								
F	6,210	378	1,803	4.7	5,415.8	5,415.8	5,416.0	0.2
G	9,384	497	1,216	6.9	5,421.8	5,421.8	5,421.9	0.1
H	11,106	541	1,327	6.4	5,431.3	5,431.3	5,431.4	0.1
I-S[2]								
T	40,351	108	672	10.4	5,508.4	5,508.4	5,508.5	0.1
U	40,463	144	1,834	3.9	5,515.4	5,515.4	5,515.4	0.0
V	40,973	1,335	4,342	1.6	5,515.7	5,515.7	5,515.7	0.0
W	41,602	815	3,425	1.9	5,515.8	5,515.8	5,515.8	0.0
X	41,973	895	3,757	1.6	5,516.6	5,516.6	5,516.6	0.0
Y	42,484	1,175	4,782	3.3	5,516.6	5,516.6	5,516.6	0.0

[1]Feet above confluence with Box Elder Creek

[2]Cross sections are outside of Adams County

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

COYOTE RUN

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
FIRST CREEK								
AN	87,165	352	1,862	2.9	5,450.2	5,450.2	5,450.2	0.0
AO	87,494	225	1,198	4.5	5,450.3	5,450.3	5,450.3	0.0
AP	88,368	268	793	6.8	5,450.8	5,450.8	5,450.8	0.0
AQ	89,587	417	1,031	5.2	5,454.9	5,454.9	5,454.9	0.0
AR	91,150	855	1,636	3.2	5,459.9	5,459.9	5,459.9	0.0
AS	92,804	655	1,221	4.3	5,465.9	5,465.9	5,465.9	0.0
AT	93,956	455	856	6.2	5,475.5	5,475.5	5,475.5	0.0

[1] Stream distance in feet above confluence with South Platte River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
FIRST CREEK E-470 SPLIT A	1,214	113	173	6.9	5,495.6	5,495.6	5,496.5	0.9

1 Stream distance in feet above confluence with First Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

FIRST CREEK E-470 SPLIT

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
FIRST CREEK TRIBUTARY T								
I	7,655	150	550	4.1	5,419.4	5,419.4	5,419.5	0.1
O	15,097	250	359	4.7	5,457.3	5,457.3	5,457.6	0.3

1 Stream distance in feet above confluence with First Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

FIRST CREEK TRIBUTARY T

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	56	73	287	0.5	5,045.5[2]	5,043.8[3]	5,043.8[3]	0.0
B	476	25	40	3.5	5,047.4	5,047.4	5,047.4	0.0
C	1,405	503	601	1.7	5,054.3	5,054.3	5,054.3	0.0
D	2,090	593	508	3.6	5,061.7	5,061.7	5,061.7	0.0
E	3,582	400	529	5.1	5,071.9	5,071.9	5,072.0	0.1
F	4,578	284	716	4.1	5,076.4	5,076.4	5,076.5	0.1
G	6,021	938	547	4.8	5,086.4	5,086.4	5,086.8	0.4
H	7,112	497	725	3.6	5,094.4	5,094.4	5,094.8	0.4
I	8,103	61	336	7.9	5,102.5	5,102.5	5,102.7	0.2
J	8,496	125	304	8.6	5,108.4	5,108.4	5,108.4	0.0
K	9,076	189	692	3.5	5,111.3	5,111.3	5,111.3	0.0
L	9,451	152	348	6.9	5,112.5	5,112.5	5,112.5	0.0
M	9,697	186	358	6.7	5,113.5	5,113.5	5,113.5	0.0
N	10,096	213	440	5.0	5,117.3	5,117.3	5,117.3	0.0
O	10,259	255	566	4.0	5,119.0	5,119.0	5,119.0	0.0
P	10,749	148	491	4.5	5,122.4	5,122.4	5,122.4	0.0
Q	11,355	287	468	4.7	5,125.1	5,125.1	5,125.1	0.0
R	11,872	445	1,055	2.9	5,128.6	5,128.6	5,128.6	0.0
S	12,193	348	517	4.3	5,129.0	5,129.0	5,129.0	0.0
T	12,552	156	517	4.3	5,133.8	5,133.8	5,133.8	0.0
U	12,944	350	1,287	9.4	5,136.2	5,136.2	5,136.2	0.0
V	13,422	81	348	6.4	5,141.1	5,141.1	5,141.1	0.0

[1] Feet above confluence with South Platte River

[2] Flooding controlled by South Platte River

[3] Elevations computed without consideration of backwater effects from South Platte River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: GRANGE HALL CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
W	13,963	313	811	4.0	5,148.3	5,148.3	5,148.3	0.0
X	15,249	265	476	4.7	5,150.8	5,150.8	5,150.8	0.0
Y	15,876	173	252	9.5	5,154.5	5,154.5	5,154.5	0.0
Z	16,455	151	608	3.6	5,158.2	5,158.2	5,158.2	0.0
AA	17,707	55	200	7.1	5,163.6	5,163.6	5,163.6	0.0
AB	19,070	105	575	4.4	5,171.5	5,171.5	5,171.5	0.0
AC	19,887	66	146	7.8	5,175.1	5,175.1	5,175.1	0.0
AD	20,305	74	238	4.8	5,184.0	5,184.0	5,184.0	0.0
AE	20,516	152	503	2.3	5,190.3	5,190.3	5,190.3	0.0
AF	21,126	831	10,890	1.6	5,218.2	5,218.2	5,218.2	0.0
AG	22,424	623	6,451	1.0	5,231.8	5,231.8	5,231.8	0.0
AH	24,596	56	231	5.4	5,235.8	5,235.8	5,235.8	0.0
AI	25,036	88	150	7.3	5,246.6	5,246.6	5,246.6	0.0
AJ	25,495	94	155	7.1	5,255.8	5,255.8	5,255.8	0.0
AK	26,630	67	195	5.2	5,260.0	5,260.0	5,260.0	0.0
AL	27,283	147	449	2.2	5,282.0	5,282.0	5,282.0	0.0
AM	27,887	522	2,476	2.3	5,290.3	5,290.3	5,290.3	0.0
AN	28,529	48	49	5.5	5,297.9	5,297.9	5,297.9	0.0
AO	28,774	47	48	5.7	5,306.6	5,306.6	5,306.6	0.0
AP	29,114	114	68	4.0	5,319.0	5,319.0	5,319.0	0.0
AQ	29,401	43	82	4.0	5,323.3	5,323.3	5,323.3	0.0
AR	30,281	56	159	2.1	5,328.0	5,328.0	5,328.0	0.0

[1] Feet above confluence with South Platte River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: GRANGE HALL CREEK

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	138	22	29	6.5	5,117.0	5,117.0	5,117.0	0.0
B	229	337	227	1.6	5,119.8	5,119.8	5,119.8	0.0
C	335	271	159	3.4	5,121.1	5,121.1	5,121.1	0.0
D	463	154	91	4.5	5,124.0	5,124.0	5,124.0	0.0
E	688	89	122	8.4	5,132.5	5,132.5	5,132.5	0.0
F	860	132	198	0.9	5,137.7	5,137.7	5,137.7	0.0
G	1,030	50	125	2.1	5,140.2	5,140.2	5,140.2	0.0
H	1,242	70	36	4.8	5,142.7	5,142.7	5,142.7	0.0
I	1,564	35	37	4.7	5,148.9	5,148.9	5,148.9	0.0
J	1,632	20	26	6.6	5,154.7	5,154.7	5,154.7	0.0
K	1,707	37	34	5.0	5,158.8	5,158.8	5,158.8	0.0
L	1,963	126	35	4.9	5,160.4	5,160.4	5,160.4	0.0
M	2,139	99	98	1.8	5,162.2	5,162.2	5,162.2	0.0

[1] Feet above confluence with Grange Hall Creek.

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: GRANGE HALL CREEK 104TH AVENUE TRIBUTARY

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	255	53	135	3.4	5,171.9	5,171.9	5,171.9	0.0
B	550	30	58	7.9	5,175.2	5,175.2	5,175.2	0.0
C	718	55	111	4.1	5,180.1	5,180.1	5,180.1	0.0
D	1,006	92	110	4.2	5,185.5	5,185.5	5,185.5	0.0
E	1,231	59	76	6.0	5,190.6	5,190.6	5,190.6	0.0
F	1,373	200	496	1.9	5,195.7	5,195.7	5,195.7	0.0
G	1,659	53	128	4.0	5,202.0	5,202.0	5,202.0	0.0
H	2,415	84	138	4.0	5,205.4	5,205.4	5,205.4	0.0
I	2,607	815	11,986	0.3	5,235.7	5,235.7	5,235.7	0.0
J	3,887	140	503	0.8	5,242.8	5,242.8	5,243.2	0.6
K	4,416	100	81	5.1	5,244.4	5,244.4	5,244.4	0.0

[1] Feet above confluence with Grange Hall Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: GRANGE HALL CREEK NORTH TRIBUTARY

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	334	348	804	1.2	5,164.0	5,164.0	5,164.0	0.0
B	867	109	248	5.2	5,165.4	5,165.4	5,165.4	0.0
C	1,056	33	105	9.5	5,174.7	5,174.7	5,174.7	0.0
D	1,151	231	694	1.9	5,176.9	5,176.9	5,176.9	0.0
E	1,407	198	191	5.2	5,183.1	5,183.1	5,183.1	0.0
F	1,666	284	551	3.2	5,193.6	5,193.6	5,193.6	0.0
G	1,872	115	253	2.5	5,193.9	5,193.9	5,193.9	0.0
H	2,047	82	100	6.2	5,196.7	5,196.7	5,196.7	0.0
I	2,481	23	73	8.6	5,204.1	5,204.1	5,204.1	0.0
J	2,890	28	79	7.9	5,212.9	5,212.9	5,212.9	0.0
K	3,300	130	411	3.2	5,215.6	5,215.6	5,216.0	0.6
L	3,736	20	64	9.8	5,228.6	5,228.6	5,228.6	0.0
M	4,040	110	402	1.6	5,232.4	5,232.4	5,232.5	0.1
N	4,331	100	118	5.3	5,233.1	5,233.1	5,233.1	0.1
O	4,742	30	86	8.4	5,238.0	5,238.0	5,238.3	0.3
P	5,303	21	90	6.9	5,253.2	5,253.2	5,253.3	0.1
Q	5,621	31	54	4.1	5,258.6	5,258.6	5,258.6	0.0
R	5,793	30	50	4.4	5,259.3	5,259.3	5,259.3	0.0
S	6,034	36	39	5.7	5,266.4	5,266.4	5,266.4	0.0
T	6,930	25	34	6.5	5,273.7	5,273.7	5,273.7	0.0
U	7,133	24	35	6.4	5,277.8	5,277.8	5,277.8	0.0
V	7,406	17	31	7.2	5,283.9	5,283.9	5,283.9	0.0
W	7,785	15	28	7.9	5,289.0	5,289.0	5,289.0	0.0

[1] Feet above confluence with Grange Hall Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: GRANGE HALL CREEK NORTHEAST TRIBUTARY

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	286	168	997	2.2	5,231.8	5,231.8	5,231.8	0.0
B	863	93	536	2.3	5,233.4	5,233.4	5,233.4	0.0
C	1,494	45	209	5.8	5,234.0	5,234.0	5,234.0	0.0
D	1,742	95	461	2.8	5,243.5	5,243.5	5,243.5	0.0
E	2,228	128	615	2.0	5,244.9	5,244.9	5,244.9	0.0
F	2,511	79	268	4.7	5,244.9	5,244.9	5,244.9	0.0
G	2,742	46	134	9.3	5,248.6	5,248.6	5,248.6	0.0
H	3,443	56	150	8.3	5,257.0	5,257.0	5,257.0	0.0
I	3,881	68	157	8.0	5,263.6	5,263.6	5,263.6	0.0
J	4,359	48	148	8.4	5,270.4	5,270.4	5,270.4	0.0
K	4,726	409	1,364	7.9	5,292.5	5,292.5	5,292.5	0.0
L	6,086	123	184	6.8	5,297.5	5,297.5	5,297.5	0.0
M	6,872	418	185	6.7	5,311.7	5,311.7	5,311.7	0.0
N	7,638	349	2,289	1.9	5,322.5	5,322.5	5,322.5	0.0
O	8,134	142	853	1.3	5,322.6	5,322.6	5,322.6	0.0
P	8,670	51	123	8.8	5,322.5	5,322.5	5,322.5	0.0
Q	9,222	50	169	6.4	5,330.6	5,330.6	5,330.6	0.0
R	9,542	289	1,048	3.1	5,338.1	5,338.1	5,338.1	0.0
S	11,423	1,270	5,400	1.0	5,370.2	5,370.2	5,370.2	0.0
T	11,683	166	780	0.9	5,370.2	5,370.2	5,370.2	0.0
U	11,987	47	222	3.7	5,376.0	5,376.0	5,376.0	0.0
V	12,270	28	77	9.5	5,379.2	5,379.2	5,379.2	0.0

[1] Feet above confluence with Grange Hall Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: GRANGE HALL CREEK SOUTH TRIBUTARY

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
W	12,680	34	58	7.4	5,394.5	5,394.5	5,394.6	0.1
X	13,147	101	75	5.5	5,401.7	5,401.7	5,401.8	0.0
Y	13,375	46	91	6.4	5,405.6	5,405.6	5,405.7	0.1
Z	13,628	60	113	5.2	5,406.8	5,406.8	5,407.2	0.3
AA	14,046	47	86	6.8	5,415.5	5,415.5	5,415.7	0.2

[1] Feet above confluence with Grange Hall Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: GRANGE HALL CREEK SOUTH TRIBUTARY

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	1,715	1,253	625	2.7	5,051.5[2]	5,049.9[3]	5,049.9[3]	0.0
B	2,563	1,289	6,842	0.1	5,052.3	5,052.3	5,052.3	0.0
C	4,726	474	119	6.5	5,052.6	5,052.6	5,052.6	0.0

[1] Feet above confluence with South Platte River

[2] Flooding controlled by South Platte River

[3] Elevation computed without consideration of backwater effects from South Platte River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: GRAVEL POND SPLIT

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HAYESMOUNT CREEK								
A	99	184	372	6.3	5,070.3	5,070.3	5,070.7	0.4
B	1,202	131	428	5.6	5,072.4	5,072.4	5,073.0	0.6
C	1,928	141	431	5.6	5,075.1	5,075.1	5,075.1	0.0
D	2,642	1,076	2,337	1.0	5,080.7	5,080.7	5,081.7	1.0
E	3,160	460	1,136	2.1	5,081.2	5,081.2	5,081.9	0.7
F	4,276	312	576	4.2	5,083.2	5,083.2	5,083.2	0.0
G	5,405	155	347	6.9	5,086.2	5,086.2	5,086.2	0.0
H	5,975	164	456	5.3	5,089.4	5,089.4	5,089.4	0.0
I	7,065	240	650	3.7	5,093.0	5,093.0	5,093.0	0.0
J	7,843	187	515	4.7	5,094.9	5,094.9	5,094.9	0.0
K	8,712	144	373	6.4	5,098.7	5,098.7	5,098.7	0.0
L	10,036	80	287	8.4	5,104.0	5,104.0	5,104.0	0.0
M	10,451	63	341	7.0	5,106.5	5,106.5	5,107.0	0.5
N	11,372	91	415	5.8	5,109.6	5,109.6	5,110.3	0.7
O	11,488	160	1,230	2.0	5,114.5	5,114.5	5,115.5	1.0
P	12,850	140	698	3.6	5,115.0	5,115.0	5,115.7	0.7
Q	13,382	210	724	3.4	5,116.0	5,116.0	5,116.3	0.3
R	14,705	213	693	3.6	5,118.9	5,118.9	5,119.9	1.0
S	15,146	89	290	8.6	5,120.5	5,120.5	5,120.6	0.1
T	15,574	194	694	3.6	5,122.0	5,122.0	5,123.1	1.1
U	16,534	135	565	4.4	5,126.3	5,126.3	5,127.3	1.0
V	17,948	230	546	4.6	5,128.8	5,128.8	5,129.8	1.0
W	18,558	157	391	6.4	5,131.2	5,131.2	5,131.8	0.6
X	18,986	179	527	4.6	5,133.2	5,133.2	5,134.1	0.9
Y	20,257	229	793	3.1	5,137.6	5,137.6	5,138.5	0.9
Z	21,321	218	342	7.1	5,139.0	5,139.0	5,139.6	0.6

[1] Feet above county boundary

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Hayesmount Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HAYESMOUNT CREEK								
AA	21,918	148	434	5.6	5,142.6	5,142.6	5,143.3	0.7
AB	23,085	154	432	5.6	5,145.5	5,145.5	5,146.3	0.8
AC	24,084	308	669	3.6	5,148.9	5,148.9	5,149.8	0.9
AD	24,616	196	341	7.1	5,152.4	5,152.4	5,152.9	0.5
AE	25,122	431	705	3.5	5,156.7	5,156.7	5,157.5	0.8
AF	26,289	527	751	3.2	5,162.5	5,162.5	5,163.4	0.9
AG	27,418	235	234	5.7	5,166.4	5,166.4	5,167.0	0.6
AH	27,807	285	446	3.0	5,168.7	5,168.7	5,169.5	0.8
AI	28,222	410	641	2.1	5,169.4	5,169.4	5,170.4	1.0
AJ	29,195	237	429	3.1	5,174.9	5,174.9	5,175.8	0.9
AK	29,701	131	205	6.5	5,178.6	5,178.6	5,178.9	0.3
AL	30,246	420	720	1.9	5,180.2	5,180.2	5,181.2	1.0
AM	30,738	460	460	2.9	5,182.8	5,182.8	5,183.0	0.2
AN	31,218	600	745	1.8	5,184.5	5,184.5	5,185.2	0.7
AO	31,776	250	896	1.5	5,188.3	5,188.3	5,189.3	1.0
AP	32,503	170	292	5.0	5,188.9	5,188.9	5,189.5	0.6
AQ	33,709	194	349	3.0	5,193.2	5,193.2	5,193.7	0.5
AR	34,708	61	78	6.4	5,195.5	5,195.5	5,196.1	0.6
AS	35,356	76	152	3.3	5,199.0	5,199.0	5,199.8	0.8
AT	35,940	128	180	2.8	5,200.4.	5,200.4	5,201.4	1.0
AU	36,874	41	103	4.8	5,204.2	5,204.2	5,205.0	0.8
AV	38,366	68	130	3.8	5,207.1	5,207.1	5,207.9	0.8
AW	38,729	37	67	7.5	5,210.2	5,210.2	5,210.5	0.3
AX	38,950	400	389	2.1	5,212.4	5,212.4	5,212.9	0.5
AY	39,871	200	380	3.9	5,215.7	5,215.7	5,216.0	0.3
AZ	40,882	143	372	4.1	5,220.3	5,220.3	5,221.1	0.8

[1] Feet above county boundary

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Hayesmount Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HAYESMOUNT CREEK EAST TRIBUTARY								
A	2,113	20	12	4.3	5,190.2	5,190.2	5,190.6	0.4
B	3,153	70	119	4.0	5,195.0	5,195.0	5,195.7	0.7
C	3,635	117	221	4.6	5,197.3	5,197.3	5,197.9	0.6
D	4,244	75	198	5.1	5,200.1	5,200.1	5,200.7	0.6
E	4,960	148	276	3.7	5,202.5	5,202.5	5,203.2	0.7
F	5,929	239	416	2.4	5,204.8	5,204.8	5,205.7	0.9
G	6,770	165	316	3.2	5,208.8	5,208.8	5,209.7	0.9
H	7,111	60	136	7.4	5,210.0	5,210.0	5,210.6	0.6
I	7,344	150	153	4.6	5,212.3	5,212.3	5,213.0	0.7
J	8,358	23	23	4.4	5,215.4	5,215.4	5,216.0	0.6
K	9,358	29	14	2.8	5,220.1	5,220.1	5,220.3	0.2
L	10,929	45	22	1.8	5,224.0	5,224.0	5,224.2	0.2
M	11,550	97	205	6.2	5,228.2	5,228.2	5,228.7	0.5
N	11,994	128	322	3.9	5,230.2	5,230.2	5,231.0	0.8
O	12,729	121	230	5.5	5,233.2	5,233.2	5,233.8	0.6

[1] Feet above confluence with Hayesmount Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Hayesmount Creek East Tributary

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HAYESMOUNT CREEK WEST TRIBUTARY								
A	1,435	240	319	6.6	5,167.0	5,167.0	5,167.3	0.3
B	2,014	210	590	3.6	5,169.9	5,169.9	5,170.7	0.8
C	2,517	309	657	3.2	5,171.4	5,171.4	5,172.1	0.7
D	2,867	192	328	6.4	5,173.1	5,173.1	5,173.6	0.5
E	3,278	305	818	2.6	5,174.5	5,174.5	5,175.4	0.9
F	3,665	163	282	7.5	5,175.5	5,175.5	5,175.9	0.4
G	4,182	228	646	3.3	5,177.9	5,177.9	5,178.8	0.9
H	4,361	190	484	4.4	5,178.4	5,178.4	5,179.2	0.8
I	4,583	296	778	2.7	5,178.9	5,178.9	5,179.8	0.9
J	4,932	207	487	4.3	5,179.7	5,179.7	5,180.5	0.8
K	5,362	342	709	3.0	5,181.1	5,181.1	5,182.0	0.9
L	6,028	265	360	5.9	5,184.5	5,184.5	5,185.1	0.6
M	6,376	331	568	3.7	5,186.6	5,186.6	5,187.4	0.8
N	6,585	109	262	8.1	5,188.4	5,188.4	5,188.4	0.0
O	6,685	290	667	3.2	5,189.5	5,189.5	5,190.3	0.8
P	7,185	235	523	3.7	5,190.8	5,190.8	5,191.6	0.8
Q	7,698	270	540	3.6	5,192.4	5,192.4	5,193.3	0.9
R	8,184	389	659	3.0	5,194.0	5,194.0	5,194.8	0.8
S	8,639	325	675	2.9	5,195.3	5,195.3	5,196.0	0.7
T	9,179	255	437	4.5	5,196.9	5,196.9	5,197.6	0.7
U	9,599	244	578	3.4	5,198.8	5,198.8	5,199.7	0.9
V	10,111	152	363	5.4	5,200.8	5,200.8	5,201.4	0.6
W	10,629	193	577	3.4	5,202.3	5,202.3	5,203.3	1.0
X	11,133	65	190	6.7	5,203.9	5,203.9	5,204.3	0.4
Y	11,653	147	512	2.5	5,205.0	5,205.0	5,205.9	0.9
Z	12,183	81	223	5.7	5,205.9	5,205.9	5,206.5	0.6

[1] Feet above confluence with Hayesmount Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Hayesmount Creek West Tributary

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HAYESMOUNT CREEK WEST TRIBUTARY								
AA	12,641	256	440	2.9	5,207.5	5,207.5	5,208.5	1.0
AB	13,154	102	130	6.4	5,210.4	5,210.4	5,210.8	0.4
AC	14,191	222	52	2.5	5,214.0	5,214.0	5,214.9	0.9
AD	14,645	126	159	6.0	5,216.6	5,216.6	5,217.1	0.5
AE	15,292	279	117	1.9	5,218.6	5,218.6	5,219.5	0.9
AF	16,298	152	197	5.7	5,220.5	5,220.5	5,221.0	0.5
AG	16,845	158	77	2.7	5,222.9	5,222.9	5,223.8	0.9
AH	17,370	59	35	6.8	5,225.3	5,225.3	5,225.7	0.4
AI	17,926	43	31	5.0	5,228.0	5,228.0	5,229.0	1.0
AJ	18,306	47	47	4.6	5,229.5	5,229.5	5,230.3	0.8

[1] Feet above conlfuence with Hayesmount Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Hayesmount Creek West Tributary

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
HOFFMAN DRAINAGEWAY								
A	456	24	43	7.5	5,087.5	5,087.5	5,087.5	0.0
B	976	29	93	3.5	5,093.2	5,093.2	5,093.2	0.0
C	1,560	38	78	4.2	5,099.3	5,099.3	5,099.3	0.0
D	2,060	29	37	6.4	5,104.1	5,104.1	5,104.1	0.0
E	2,560	30	43	5.5	5,110.9	5,110.9	5,110.9	0.0
F	3,060	11	26	8.9	5,122.0	5,122.0	5,122.0	0.0
G	3,536	43	91	2.4	5,132.6	5,132.6	5,132.6	0.0
H	4,010	22	37	6.8	5,136.1	5,136.1	5,136.1	0.0
I	4,510	20	46	4.7	5,142.7	5,142.7	5,142.7	0.0
J	5,074	35	78	2.8	5,153.6	5,153.6	5,153.6	0.0
K	6,564	115	314	3.1	5,179.4	5,179.4	5,180.1	0.7
L	7,138	71	127	7.6	5,185.5	5,185.5	5,185.5	0.0
M	7,674	323	208	4.0	5,195.5	5,195.5	5,195.5	0.0
N	8,242	135	126	5.4	5,204.8	5,204.8	5,204.8	0.0
O	8,732	99	113	6.0	5,211.0	5,211.0	5,211.0	0.0
P	9,482	82	93	6.2	5,221.8	5,221.8	5,221.8	0.0
Q	9,882	59	70	5.5	5,230.5	5,230.5	5,230.5	0.0
R	10,532	82	71	5.3	5,248.4	5,248.4	5,248.4	0.0
S	11,034	56	19	3.4	5,267.8	5,267.8	5,267.8	0.0
T	11,434	30	16	4.2	5,276.4	5,276.4	5,276.4	0.0
U	11,808	60	20	3.3	5,280.6	5,280.6	5,280.6	0.0
V	12,234	87	29	3.2	5,293.5	5,293.5	5,293.5	0.0
W	12,734	75	27	3.4	5,309.3	5,309.3	5,309.3	0.0

[1] Feet Above Confluence With South Platte River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
And Incorporated Areas

FLOODWAY DATA

HOFFMAN DRAINAGEWAY

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	643	275	463	3.8	5,043.3[2]	5,041.7[3]	5,041.7[3]	0.0
B	842	88	234	7.6	5,043.3[2]	5,043.1[3]	5,043.1[3]	0.0
C	1,202	761	3,507	1.2	5,044.4	5,044.4	5,044.4	0.0
D	1,971	95	133	6.6	5,051.2	5,051.2	5,051.2	0.0
E	2,339	108	220	4.0	5,055.3	5,055.3	5,055.3	0.0
F	2,714	69	141	6.3	5,057.8	5,057.8	5,057.8	0.0
G	3,107	118	362	2.4	5,061.6	5,061.6	5,061.6	0.0

[1] Feet above confluence with South Platte River

[2] Flooding controlled by South Platte River

[3] Elevation computed without consideration of backwater effects from South Platte River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: LARSON SPLIT

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
LITTLE COMANCHE CREEK								
A	565	555	856	6.5	5,364.9	5,364.9	5,364.9	0.0
B	1,035	423	817	6.9	5,368.0	5,368.0	5,368.0	0.0

[1] Feet above mouth

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Little Comanche Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
LITTLE DRY CREEK								
A	2,428	125	1,007	3.3	5,219.0	5,219.0	5,219.3	0.3
B	2,931	210	970	3.4	5,225.2	5,225.2	5,225.9	0.7
C	3,899	153	747	4.4	5,231.5	5,231.5	5,232.4	0.9
D	4,610	97	629	5.2	5,235.0	5,235.0	5,235.8	0.8
E	5,103	136	630	5.2	5,238.6	5,238.6	5,238.8	0.2
F	5,447	97	565	8.8	5,243.5	5,243.5	5,243.5	0.0
G	5,670	441	4,206	0.8	5,256.8	5,256.8	5,256.8	0.0
H	5,920	415	4,044	0.9	5,256.8	5,256.8	5,256.8	0.0
I	6,370	247	2,271	1.7	5,256.8	5,256.8	5,256.8	0.0
J	7,350	155	507	7.5	5,256.9	5,256.9	5,256.9	0.0
K	7,481	245	1,047	3.6	5,259.2	5,259.2	5,259.2	0.0
L	7,950	150	581	6.5	5,260.3	5,260.3	5,260.3	0.0

[1] Feet above confluence with Clear Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Little Dry Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
NIVER CREEK								
A	1,160	40	326	9.0	5,107.0	5,107.0	5,107.0	0.0
B	1,425	70	570	5.2	5,117.9	5,117.9	5,117.9	0.0
C	1,650	70	462	6.4	5,118.1	5,118.1	5,118.1	0.0
D	2,145	60	292	11.1	5,118.3	5,118.3	5,118.3	0.0
E	2,350	60	344	9.4	5,119.7	5,119.7	5,119.7	0.0
F	2,650	65	307	10.6	5,122.6	5,122.6	5,122.6	0.0
G	3,125	62	280	11.6	5,125.1	5,125.1	5,125.1	0.0
H	3,665	62	745	4.3	5,137.3	5,137.3	5,137.3	0.0
I	3,835	45	264	12.3	5,146.5	5,146.5	5,146.5	0.0
J	4,185	60	304	10.3	5,149.0	5,149.0	5,149.0	0.0
K	4,490	60	293	8.8	5,152.5	5,152.5	5,153.0	0.5
L	5,150	55	252	12.5	5,157.9	5,157.9	5,157.9	0.0
M	5,645	60	320	9.8	5,161.4	5,161.4	5,161.4	0.0
N	5,915	345	273	11.5	5,162.4	5,162.4	5,162.4	0.0
O	6,100	30	770	4.1	5,167.5	5,167.5	5,167.5	0.0
P	6,425	275	539	5.8	5,169.2	5,169.2	5,169.2	0.0
Q	6,680	85	332	9.5	5,170.4	5,170.4	5,170.4	0.0
R	7,580	120	331	9.5	5,177.4	5,177.4	5,177.4	0.0
S	8,150	78	232	13.6	5,182.8	5,182.8	5,182.8	0.0
T	8,270	131	320	9.8	5,185.4	5,185.4	5,185.4	0.0
U	8,685	95	306	10.3	5,190.1	5,190.1	5,190.1	0.0
V	9,040	50	187	9.1	5,193.7	5,193.7	5,193.7	0.0
W	9,230	40	169	9.7	5,196.0	5,196.0	5,196.0	0.0
X	9,680	45	214	13.0	5,199.1	5,199.1	5,199.1	0.0

[1] Feet above confluence with South Platte River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Niver Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
NORTHFIELD CREEK								
A	280	560	2,012	0.6	5,158.9	5,158.9	5,158.9	0.0
B	1,280	193	212	5.7	5,170.0	5,170.0	5,170.0	0.0
C	1,840	350	347	3.5	5,177.3	5,177.3	5,177.3	0.0
D	1,900	360	634	1.6	5,178.3	5,178.3	5,178.3	0.0
E	2,440	72	131	7.6	5,178.9	5,178.9	5,178.9	0.0
F	3,100	237	194	5.2	5,197.0	5,197.0	5,197.0	0.0
G	3,130	338	217	4.6	5,197.8	5,197.8	5,197.8	0.0

[1] Feet above Union Pacific Railroad

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Northfield Creek

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	208	90	366	0.6	5,111.2	5,111.2	5,111.2	0.0
B	756	23	32	6.8	5,113.7	5,113.7	5,113.7	0.0
C	796	190	108	2.5	5,123.2	5,123.2	5,123.2	0.0
D	1,535	113	65	2.3	5,129.3	5,129.3	5,129.3	0.0
E	1,780	22	20	5.2	5,135.9	5,135.9	5,135.9	0.0
F	1,965	97	59	1.8	5,139.5	5,139.5	5,139.5	0.0
G	2,125	74	30	3.5	5,144.0	5,144.0	5,144.0	0.0
H	2,465	62	31	3.4	5,150.2	5,150.2	5,150.2	0.0
I	2,632	15	18	5.9	5,156.5	5,156.5	5,156.5	0.0
J	2,955	30	22	4.9	5,158.3	5,158.3	5,158.3	0.0
K	3,191	32	25	4.2	5,163.6	5,163.6	5,163.6	0.0
L	3,404	32	23	4.6	5,171.2	5,171.2	5,171.2	0.0
M	3,543	47	48	5.3	5,175.3	5,175.3	5,175.3	0.0
N	3,853	256	1,637	0.1	5,191.2	5,191.2	5,191.2	0.0
O	4,163	391	4,095	0.3	5,204.8	5,204.8	5,204.8	0.0
P	4,952	63	78	6.1	5,210.8	5,210.8	5,210.8	0.0

[1] Feet above confluence with Grange Hall Creek

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: RIVERDALE TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SAND CREEK								
A	210	234	-- [2]	-- [2]	5,117.7 [3]	5,117.7 [3]	5,117.7	0.0
B	720	280	2,265	13.5	5,121.0	5,121.0	5,121.0	0.0
C	1,170	255	2,819	10.8	5,124.3	5,124.3	5,124.3	0.0
D	1,380	170	2,563	11.9	5,124.6	5,124.6	5,124.6	0.0
E	1,500	240	5,198	5.9	5,135.2	5,135.2	5,135.2	0.0
F	2,030	460	4,886	6.2	5,136.0	5,136.0	5,136.0	0.0
G	2,530	403	3,458	8.8	5,136.2	5,136.2	5,136.4	0.2
H	2,970	403	3,304	9.2	5,137.6	5,137.6	5,137.6	0.0
I	3,760	300	2,937	10.4	5,141.2	5,141.2	5,141.2	0.0
J	4,100	370	3,204	9.5	5,142.8	5,142.8	5,142.8	0.0
K	4,325	321	2,887	10.6	5,143.4	5,143.4	5,143.4	0.0
L	4,445	321	4,298	7.1	5,152.0	5,152.0	5,152.0	0.0
M	4,530	349	4,297	7.1	5,152.1	5,152.1	5,152.1	0.0
N	4,700	448	4,875	6.3	5,154.8	5,154.8	5,154.8	0.0
O	4,990	300	4,150	8.1	5,154.9	5,154.9	5,154.9	0.0
P	5,350	332	4,140	8.7	5,155.5	5,155.5	5,155.5	0.0
Q	5,730	279	4,006	9.8	5,155.9	5,155.9	5,155.9	0.0
R	6,280	445	5,156	7.4	5,157.3	5,157.3	5,157.7	0.4
S	6,740	472	5,575	6.0	5,160.9	5,160.9	5,161.5	0.6
T	7,290	468	4,390	8.0	5,161.6	5,161.6	5,162.1	0.5
U	7,800	346	4,205	8.2	5,162.8	5,162.8	5,163.3	0.5
V	7,930	292	2,029	15.0	5,165.4	5,165.4	5,165.4	0.0
W	8,150	440	3,078	9.9	5,166.4	5,166.4	5,166.4	0.0
X	8,840	516	3,964	7.7	5,171.4	5,171.4	5,171.4	0.0
Y	9,100	344	3,443	8.9	5,171.9	5,171.9	5,171.9	0.0
Z	9,180	358	3,523	8.7	5,172.1	5,172.1	5,172.1	0.0

[1] Feet above confluence with South Platte River
[2] Data not available
[3] Elevation computed without consideration of backwater effects from South Platte River

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Sand Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SAND CREEK								
AA	9,620	496	4,352	7.0	5,173.6	5,173.6	5,173.6	0.0
AB	10,240	389	3,906	7.8	5,174.6	5,174.6	5,174.6	0.0
AC	10,920	206	2,094	14.6	5,175.3	5,175.3	5,175.3	0.0
AD	11,220	311	3,141	9.7	5,178.7	5,178.7	5,178.7	0.0
AE	11,940	429	4,828	6.2	5,180.7	5,180.7	5,180.7	0.0
AF	12,020	324	1,879	16.0	5,183.9	5,183.9	5,183.9	0.0
AG	12,220	398	3,816	7.8	5,188.0	5,188.0	5,188.1	0.1
AH	12,490	375	3,576	8.4	5,188.4	5,188.4	5,188.4	0.0
AI	13,040	648	4,094	7.2	5,189.3	5,189.3	5,189.6	0.3
AJ	13,520	648	3,598	8.3	5,191.2	5,191.2	5,191.6	0.4
AK	13,620	609	2,547	11.8	5,192.5	5,192.5	5,192.6	0.1
AL	13,730	617	4,193	7.1	5,194.3	5,194.3	5,194.6	0.3
AM	14,210	663	3,629	8.3	5,195.9	5,195.9	5,196.0	0.1
AN	14,740	547	3,302	9.1	5,198.0	5,198.0	5,198.1	0.1
AO	15,250	547	3,121	9.6	5,199.7	5,199.7	5,199.9	0.2
AP	15,545	399	2,413	12.4	5,200.6	5,200.6	5,200.7	0.1
AQ	15,770	302	2,114	14.2	5,204.5	5,204.5	5,204.7	0.2
AR	16,880	361	3,249	9.2	5,211.1	5,211.1	5,211.1	0.0
AS	17,500	246	2,454	12.2	5,212.7	5,212.7	5,212.7	0.0
AT	18,170	248	2,830	10.6	5,216.2	5,216.2	5,216.2	0.0
AU	18,550	139[2]	1,565	19.2	5,216.7	5,216.7	5,216.7	0.0
AV	18,660	237[2]	3,020	9.9	5,221.6	5,221.6	5,221.6	0.0
AW	18,880	353[2]	2,942	10.2	5,222.1	5,222.1	5,222.1	0.0

[1] Feet above confluence with South Platte River
[2] Width extends beyond corporate limits

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

Sand Creek

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SECOND CREEK								
C	72,783	380	1,065	3.6	5,324.4	5,324.4	5,324.8	0.4
D	73,489	185	542	5.8	5,328.9	5,328.9	5,329.1	0.2
E	73,984	156	436	7.3	5,332.2	5,332.2	5,332.6	0.4
F	74,428	278	610	4.7	5,335.3	5,335.3	5,335.7	0.4
G	74,880	224	489	5.1	5,338.7	5,338.7	5,339.0	0.3
H[2]								
I[2]								
J[2]								
K[2]								
L[2]								
M[2]								
N[2]								
O[2]								
P[2]								
Q	83,810	122	286	5.6	5,405.8	5,405.8	5,406.2	0.4
R	84,809	107	198	8.5	5,414.6	5,414.6	5,414.8	0.2

[1] Stream distance in feet above confluence with South Platte River

[2] Cross Section located entirely outside of Adams County Corporate Limits

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO

AND INCORPORATED AREAS

FLOODWAY DATA

SECOND CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SOUTH PLATTE RIVER								
A	83	2,847	10,040	3.4	4,956.0	4,956.0	4,956.3	0.3
B	2,636	3,059	12,416	2.7	4,956.8	4,956.8	4,957.7	0.9
C	4,633	1,784	5,684	5.9	4,959.1	4,959.1	4,960.1	1.0
D	5,375	1,444	7,389	4.6	4,961.8	4,961.8	4,962.8	1.0
E	5,820	1,636	7,128	4.7	4,963.3	4,963.3	4,963.9	0.6
F	7,185	2,227	11,623	2.9	4,966.6	4,966.6	4,966.9	0.3
G	10,222	1,979	10,139	3.3	4,968.6	4,968.6	4,969.2	0.6
H	12,862	2,224	9,357	3.6	4974.0/4973.3 [2]	4,973.3	4,973.9	0.6
I	14,170	2,998	9,194	3.7	4975.2/4974.0 [2]	4,974.0	4,975.0	1.0
J	14,840	3,203	9,534	3.5	4982.0/4977.1 [2]	4,977.1	4,977.7	0.6
K	17,319	2,403	9,745	3.5	4982.4/4981.6 [2]	4,981.6	4,982.1	0.5
L	19,170	2,198	10,401	3.2	4984.5/4984.2 [2]	4,984.2	4,985.0	0.8
M	22,769	1,810	7,234	4.7	4988.8/4989.0 [2]	4,989.0	4,990.0	1.0
N	26,251	959	5,592	6.0	4994.7/4993.8 [2]	4,993.8	4,994.5	0.7
O	27,370	1,125	7,228	4.7	4,995.1	4,995.1	4,995.7	0.6
P	31,602	560	5,223	6.5	5,002.0	5,002.0	5,002.9	0.9
Q	33,095	1,073	6,915	4.9	5,004.5	5,004.5	5,005.3	0.8
R	34,333	591	6,455	5.2	5,006.1	5,006.1	5,007.1	1.0
S	35,163	559	6,363	5.3	5,007.7	5,007.7	5,008.6	0.9
T	36,127	336	8,311	4.1	5,009.9	5,009.9	5,010.7	0.8
U	37,261	303	14,698	2.3	5,010.6	5,010.6	5,011.4	0.8
V	37,924	216	4,604	7.3	5,013.0	5,013.0	5,013.4	0.4
W	38,010	220	10,175	5.1	5,015.8	5,015.8	5,015.8	0.0
X	39,002	1,100	12,467	2.7	5,017.9	5,017.9	5,017.9	0.0
Y	40,319	1,425	7,375	4.7	5,018.5	5,018.5	5,018.6	0.1
Z	46,566	2,340	7,773	4.6	5,027.9	5,027.9	5,028.3	0.4

[1] Feet above Adams County boundary

[2] Levee intact model run/levee failure model run – reflects the East Levee intact/East Levee failure

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

South Platte River

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
SOUTH PLATTE RIVER								
AA	51,152	2,959	7,664	4.7	5,032.4	5,032.4	5,033.4	1.0
AB	54,648	2,755	10,377	3.4	5,036.2	5,036.2	5,037.2	1.0
AC	56,556	2,177	4,716	7.6	5,041.0	5,041.0	5,041.7	0.7
AD	59,349	1,992	7,288	4.9	5,046.3	5,046.3	5,047.1	0.8
AE	60,000	1,666	7,627	4.7	5,047.6	5,047.6	5,048.4	0.8
AF	63,146	2,655	9,563	3.8	5,053.7	5,053.7	5,054.7	1.0
AG	66,352	2,148	10,281	3.5	5,059.2	5,059.2	5,060.2	1.0
AH	68,485	2,409	6,925	5.2	5,063.4	5,063.4	5,063.4	0.0
AI	70,165	1,633	9,851	3.7	5,067.4	5,067.0	5,067.0	0.0
AJ	73,920	2,650	11,305	3.3	5,072.6	5,072.7	5,072.7	0.0
AK	77,920	217	1,564	15.2	5,081.0	5,081.0	5,081.0	0.0
AL	79,312	348	16,478	2.3	5087.0/5082.4 [2]	5,082.4	5,083.3	0.9
AM	84,091	320	3,795	9.8	5092.7/5092.3 [2]	5,092.3	5,093.0	0.7
AN	85,547	200	2,956	12.6	5,097.2	5,097.2	5,097.4	0.2
AO	88,749	340	5,771	6.6	5,104.4	5,104.4	5,104.6	0.2
AP	90,511	418	4,922	7.6	5,106.5	5,106.5	5,106.6	0.1
AQ	91,391	430	5,518	6.8	5,107.7	5,107.7	5,107.8	0.1
AR	92,500	383	4,421	8.5	5,108.8	5,108.8	5,108.8	0.0
AS	93,736	575	6,231	6.0	5,110.7	5,110.7	5,110.8	0.1
AT	95,106	236	2,852	13.2	5,111.5	5,111.5	5,111.7	0.2
AU	95,431	199	5,076	7.5	5,115.8	5,115.8	5,115.8	0.0
AV	97,453	199	2,008	10.9	5,117.5	5,117.5	5,117.5	0.0
AW	97,875	211	2,512	8.7	5,118.6	5,118.6	5,118.6	0.0
AX	99,297	191	2,691	8.1	5,120.9	5,120.9	5,120.9	0.0
AY	100,490	196	1,929	11.3	5,122.5	5,122.5	5,122.5	0.0

[1] Feet above Adams County boundary

[2] Levee intact model run/levee failure model run – reflects the East Levee intact/East Levee failure

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

FLOODWAY DATA

South Platte River

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base (1-percent-annual-chance) flood elevations (BFEs) or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the FIS report by detailed methods. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot base flood depths derived from the detailed hydraulic analyses are shown within this zone.

Zone AR

Zone AR is the flood insurance risk zone that corresponds to an area of special flood hazard formerly protected from the 1-percent-annual-chance flood event by the flood-control system that was subsequently decertified. Zone AR indicates that the former flood-control system is being restored to provide protection from the 1-percent-annual-chance or greater flood event.

Zone A99

Zone A99 is the flood insurance risk zone that corresponds to areas of the 1-percent-annual-chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No BFEs or depths are shown within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile (sq. mi.), and areas protected from the base flood by levees. No BFEs or depths are shown within this zone.

Zone X (Future Base Flood)

Zone X (Future Base Flood) is the flood insurance risk zone that corresponds to the 1-percent-annual-chance floodplains that are determined based on future-conditions hydrology. No BFEs or base flood depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot BFEs or average depths. Insurance agents use zones and BFEs in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1- and 0.2-percent-annual-chance floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

The current FIRM presents flooding information for the entire geographic area of Adams County, excluding those communities which fall within more than one county as described in Section 1.1. Previously, separate Flood Hazard Boundary Maps (FHBMs) and/or FIRMs were prepared for each identified floodprone incorporated community and the unincorporated areas of the county. Historical data relating to the maps prepared for each community prior to August 16, 1995, the initial countywide FIS, are presented in Table 5, “Community Map History.”

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Adams County, (Unincorporated Areas)	February 1, 1979	N/A	February 1, 1979	December 15, 1989
Bennett, Town of [1]	N/A	N/A	N/A	N/A
Brighton, City of	February 22, 1974	October 15, 1976	November 16, 1977	N/A
Commerce City, City of	June 28, 1974	July 11, 1975	February 15, 1978	October 6, 1978 January 19, 1982 September 30, 1988 December 5, 1989
Federal Heights, City of	July 11, 1975	N/A	April 15, 1986	N/A

[1] This community does not have map history prior to the first countywide mapping

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

COMMUNITY NAME	INITIAL IDENTIFICATION	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	FIRM EFFECTIVE DATE	FIRM REVISIONS DATE
Northglenn, City of	August 22, 1975	N/A	September 15, 1978	March 31, 1981
Thornton, City of	November 1, 1974	October 1, 1976	June 15, 1978	January 19, 1982

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

ADAMS COUNTY, CO
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

This FIS supersedes all previous FIS reports and FIRMs covering the unincorporated areas of Adams County and the incorporated areas of the Cities of Brighton, Commerce City, Federal Heights, Northglenn, and Thornton, and the Town of Bennett (References 2, 5, 7, 8, 9, and 10, respectively). For these areas, it should be considered authoritative for the purposes of the NFIP. The Cities of Arvada, Aurora, and Westminster have individual, separately published FIS (References 3 and 4) that are not superseded by this countywide FIS.

There are past published reports on flooding throughout Adams County. The 1963 USACE Denver Metropolitan Region Flood Plain Information (FPI) report, Volume I, (Reference 21) was adopted by the Colorado Water Conservation Board (CWCB) in 1967 as the official floodplain study for the South Platte River. Following the 1965 flood and other, more recent, flood experiences, as well as the construction of Chatfield Dam, the USACE considers the 1963 FPI for the South Platte River to be outdated. In September of 1977, the UDFCD published a Flood Hazard Area Delineation of the South Platte River.

The UDFCD published an updated Flood Hazard Area Delineation Report of the South Platte River in April of 2005 (Reference 85). This report was incorporated into this FIS.

An FPI report (Reference 30) was prepared in 1968 by the USACE, Omaha District, which included Little Dry Creek in Adams County. Minor discrepancies occurred because the USACE assumed blockage at culverts and bridges during flooding stages, and the present study is based on unobstructed flow.

The UDFCD published a report on Big Dry Creek (Reference 20) in March 1973 and was incorporated into the FIS.

The UDFCD published a Flood Hazard Area Delineation report for the Lower Box Elder Creek Watershed in September 2001 (Reference 89). This report identified flood hazard information on Box Elder Creek, Hayesmount Creek, and Bear Gulch. This report was incorporated into this FIS.

An FPI report was published in January 1966 by the USACE, Omaha District, regarding flooding along Clear Creek (Reference 12). Peak discharges for Clear Creek were recomputed by the UDFCD, and the revised floodplain boundaries were incorporated as an approximate Special Flood Hazard Area. The FIS study report was later revised to reflect updated hydrologic and hydraulic analyses prepared in a 1979 UDFCD report (Reference 59) for Clear Creek. The revised flooding was included as a detailed analysis. Floodway and 0.2-percent-annual-chance floodplain boundaries were not determined.

The UDFCD published a report on Niver Creek in February 1974 (Reference 54). The report contained two 1-percent-annual-chance profiles, one reflected existing conditions and a fully developed basin, and the second reflected channel improvements with discharges based on a fully developed basin. Since the publication, some of the channel improvements have been made. Also, this FIS report reflects only present basin development. Therefore, no comparison can be made between profiles.

A report on Northfield Creek, prepared by Hogan & Olhausen for the City of Thornton (Reference 55), was published in March 1976. When compared, the 1-percent-annual-chance discharges in

this study were found to be different from those determined for the present FIS study. This difference is due to the different methods used to determine discharges. A meeting was held on April 16, 1976, with the UDFCD, the City of Thornton, Hogan & Olhausen, and Gingery Associates in order to resolve the difference in discharges. The main reason for the discrepancy was because Hogan & Olhausen considered residential areas as being 25 percent impervious while the present study used a 50 percent impervious figure, the figure recommended by the UDFCD in their USDCM for use in the Denver metropolitan area. At this meeting, a resolution was never confirmed; therefore, the FIA was contacted for a final ruling. The FIA decided to use the 50 percent impervious figure.

Approximate flood boundaries were adopted from studies on First Creek (Reference 56), Second and Third Creeks (Reference 57), and Grange Hall Creek (Reference 58).

Zone A approximate flooding has been added to the FIRM for Brantner Gulch, Tributary VIII Northern to Brantner Gulch, Direct Flow Area 0054-1, McKay Lake Drainageway, Morris Creek, Mustang Run, Preble Creek, South Fork Preble Creek, Quail Creek, Sack Creek, Sack Creek South, Shay Ditch, Short Run, Todd Creek, Tributary 2 to Todd Creek, Tributary 4 to Todd Creek, Wadley Creek North, and Wadley Creek South. The source of the flood data for the identified streams was UDFCD Flood Hazard Area Delineation reports (References 60-64).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting FEMA, Mitigation Division, Denver Federal Center, Building 710, Box 25267, Denver, CO 80225-0267.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Colorado Water Conservation Board, Approximate Flood Plain Analyses for Federal Heights, Colorado, August 1986, unpublished

2. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Adams County, Colorado, and Incorporated Areas, Revised August 16, 1995.

3. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Arvada, Colorado, Revised February 1992

4. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Aurora, Colorado, Revised September 1992

5. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Brighton, Colorado, February 1977

6. "Community Facts" for Adams County, City of Brighton, City of Commerce City, City of Federal Heights, City of Northglenn, City of Thornton, and Unincorporated Adams County. Online U.S. Census Bureau. March 13, 2013. < http://factfinder2,census.gov>

7. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Commerce City, Colorado, Revised December 1989

8. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Federal Heights, Colorado, April 1986

9. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Northglenn, Colorado, March 1978

10. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Thornton, Colorado, Revised January 1982

11. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Westminster, Colorado, Revised May 1993

12. U.S. Department of the Army, Corps of Engineers, Omaha District, Flood Plain Information — Denver Metropolitan Region — Volume III, Summary Report and Technical Appendix, on Bear and Clear Creeks, South Platte River Basin, January 1966

13. "Town of Bennett History." Town of Bennett. 2001-2005. Town of Bennett, Colorado. 14 Apr. 2005 <http://www.townofbennett.org/information/default.asp?NavPagelD=8449>.

14. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population Characteristics of the Population, Part 7, Chapter A, October 1981

15. City of Thornton, Thornton: A Comprehensive Plan, March 1975

16. Colorado Municipal League, 1976 Directory Municipal and County Officials in Colorado, Wheat Ridge, Colorado, July 1976

17. U.S. Geological Survey, Water Supply Paper 997, Floods in Colorado, R. Follansbee and L. R. Sawyer, 1948

18. Hotchkiss, Inc., Trajectory of a Tragedy - Denver Area Flood, June 16th-17th, 1965, G. F. Meister and E. J. Haley, 1965

19. Colorado Water Conservation Board, South Platte River-State of Colorado-Flood of May, 1973

20. Urban Drainage and Flood Control District, Big Dry Creek Master Plan — Major Drainageway Planning (City of Westminster, Adams County, Jefferson County) Volumes I and II, Wright-McLaughlin Engineers, Denver, Colorado, March 1973

21. U.S. Department of the Army, Corps of Engineers, Omaha District, Flood Plain Information Study — South Platte River Basin, Colorado — Denver Metropolitan Region, 1963, update 1968

22. U.S. Department of the Army, Corps of Engineers, Omaha District, Letter dated October 17, 1977, from J. E. Velehradsky, Chief, Planning Division

23. Urban Drainage and Flood Control District, Urban Storm Drainage Criteria Manual., Volumes I & II, Wright-McLaughlin Engineers, Denver, Colorado, March 1969

24. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Package, 723-010, Davis, California 1973

25. U.S. Water Resources Council, A Uniform Technique for Determining Flood Flow Frequencies, Bulletin 15, December 1967

26. U.S. Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States: For Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years, D. H. Hershfield, May 1961

27. U.S. Geological Survey, Water Paper No. 1680, Magnitude and Frequency of Floods in the United States — Part 6B., Lower Mississippi River Basin, 1964

28. U.S. Geological Survey, Water Resources Data for Colorado, Part 1, Surface Water Records, 1972

29. U.S. Geological Survey, Water Supply Paper 1850-B, Floods of June 1965, in South Platte River Basin, Colorado, 1969

30. U.S. Department of the Army, Corps of Engineers, Omaha District, Flood Plain Information — Big Dry Creek, Little Dry Creek (Arapahoe County), Greenwood Gulch, Weir Gulch, Lakewood Gulch, South Lakewood Gulch, McIntyre Gulch, Little Dry Creek (Adams County), Grange Hall Creek — Denver Metropolitan Region, Volume IV, 1968

31. Urban Drainage and Flood Control District, Colorado Urban Hydrograph Procedure Computer Program, 1983

32. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Atlas 2, Precipitation-Frequency Atlas of the Western United States, Volume III, Colorado, 1973

33. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Adams County, Colorado, October 1974

34. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Quadrangles, Scale 1:24,000, Contour Interval 10 feet: Arvada, Colorado (1965), Photorevised (1980); Commerce City, Colorado (1965), Photorevised (1980); Lafayette, Colorado (1965), Photorevised (1971); East Lake, Colorado (1965), Photorevised (1971); Brighton, Colorado (1965), Photorevised (1971); Mile High Lakes, Colorado (1966); Horse Creek, Colorado (1952); Sunnydale, Colorado (1948); Living Springs, Colorado (1951);

Reper School, Colorado (1950); Bennett, Colorado (1948); Manila, Colorado (1951); Box Elder School, Colorado (1966), Photorevised (1973); Sable, Colorado (1965), Photorevised (1971); Fostlake, Colorado (1965), Photorevised (1971)

35. Jack Scharf and Associates, Topographic Maps, Scale 1:1,200, Contour Interval 2 feet: Federal Heights, Colorado (1977), Revised (1980)

36. Denver Region Urban Drainage and Flood Control District, Urban Storm Drainage Criteria Manual, Volumes I and II, Wright McLaughlin Engineers, City of Northglenn, City of Thornton, and Adams County, September 1976

37. Denver Region Urban Drainage and Flood Control District, Major Drainageway Planning Grange Hall Creek Phase A Report, Hydro-Triad, Ltd., September 1976

38. U.S. Department of the Army Corps of Engineers, Hydrologic Engineering Center, HEC-1 Flood Hydrograph Generalized Computer Program, Davis, California, November 1981

39. U.S. Department of the Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, 1976

40. Urban Drainage and Flood Control District, Colorado Water Conservation Board, Flood Hazard Area Delineation, South Platte River, Adams County, (prepared by Gingery Associates, Inc.), September 1977, includes topographic mapping with an original scale of 1:24,000, Contour Interval of 2 feet, by Merrick and Company, dates flown April and May, 1976, and Bell Mapping Company, date flown December, 1975

41. Urban Drainage and Flood Control District, Sand Creek Major Drainageway Planning Report, South Platte River to East Corporate Boundary of Aurora, Colorado: Development of Preliminary Plan-Phase B, prepared by Simons, Li and Associates, Inc., Denver, Colorado, January 1984

42. Bell Mapping Company, Grange Hall Creek and Tributaries Aerial Mapping, Scale 1:6,000, Contour Interval 2 feet, prepared for the Urban Drainage and Flood Control District, Denver, Colorado, January 14, 1976

43. Delta Aerial Surveys, Inc., Topographic and Planimetric Maps, Scale 1:2,400, Contour Interval 2 feet, 1976

44. Denver Region Urban Drainage and Flood Control District, Phase B Report, Water and Drainage at Niver Creek, Engineering Consultants, Inc., February 1974

45. City of Thornton, Colorado, Interim Drainage Study of the Hoffman Way and Highland High School Drainage Basins, Hogan & Olhausen, P.C., March 1976

46. Urban Drainage and Flood Control District, Major Drainageway Planning, Hidden Lake - Bates Lake, City of Arvada — Adams County, Hydro-Triad, CTD, November 1975

47. Merrick & Company, Niver Creek Aerial Mapping, Scale 1:6,000, Contour Interval 2 feet, Denver, Colorado, April 24, 1972

48. Kucera & Associates, Inc., Big Dry Creek Aerial Mapping, Scale 1:2,400, Contour Interval 2 feet, Denver, Colorado, April 24, 1972

49. Sutherland Engineers, Incorporated, Topographic Maps, Niver Creek and Tributary L of Niver Creek, Scale 1:1,200, Contour Interval 2 feet: Approximate Flood Plain Map, City of Federal Heights, Colorado, Colorado Water Conservation Board, August 1985

50. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Maps, Scale 1:1,000, City of Thornton, Colorado, November 1974

51. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map of the City of Northglenn, Colorado, Scale 1:12,000, August 1975

52. U.S. Geological Survey, Map of Flood Prone Areas, Scale 1:23,000, Contour Interval 10 feet: Lafayette, Colorado, (1973); Brighton, Colorado, (1973); Mile High Lake, Colorado (1973); Box Elder School, Colorado (1973); Sable, Colorado, (1973); Northglenn, Colorado (1972), Photorevised (1975)

53. Urban Drainage and Flood Control District, Flood Hazard Areas Delineation on Second Creek and Third Creek, Gingery Associates, Inc., 1975

54. Denver Region Urban Drainage and Flood Control District, Phase B Report, Water and Drainage at Niver Creek, Engineering Consultants, Inc., February 1974

55. City of Thornton, Colorado, Interim Drainage Study of the Hoffman Way and Highland High School Drainage Basins, Hogan & Olhausen, P.C., March 1976

56. Urban Drainage and Flood Control District, Major Drainageway Planning, First Creek, Engineering Consultants, Inc., March 1977

57. Urban Drainage and Flood Control District, Flood Hazard Area Delineation, Second Creek and Third Creek, Gingery Associates, Inc., February 1976

58. Urban Drainage and Flood Control District, Major Drainageway Planning, Grange Hall Creek, Hydro-Triad Ltd. Water Resource Engineers, December 1977

59. Urban Drainage and Flood Control District, Flood Hazard Area Delineation, Clear Creek, Adams County and Jefferson County, prepared by Gingery Associates, Inc., November 1979

60. Urban Drainage and Flood Control District, Flood Hazard Area Delineation, Todd Creek, Adams County, prepared by Muller Engineering Company, December 1985

61. Urban Drainage and Flood Control District, Flood Hazard Area Delineation, Big Dry Creek (ADCO), North Area Tributaries, City of Thornton, Adams County, prepared by Wright Water Engineers, July 1989

62. Urban Drainage and Flood Control District, Flood Hazard Area Delineation, Quail Creek & Tributaries and McKay Lake Basin, prepared by Greenhorne & O'Mara, Inc., July 1986

63. Urban Drainage and Flood Control District, Flood Hazard Area Delineation, Brantner Gulch and Tributaries, City of Thornton and Adams County, January 1983, prepared by Sellards and Grigg, Inc.

64. Urban Drainage and Flood Control District, Flood Hazard Area Delineation, Direct Flow Area 0054, Adams County, City of Thornton, October 1979, prepared by Merrick and Company

65. Delta Aerial Surveys, Inc., Topographic Maps, Scale 1:1,200, Contour Interval 2 feet: South Platte River, April 1983

66. Engineering Consultants, Inc., Aurora Water and Drainage at First Creek, Phase A, July 1974

67. Urban Drainage and Flood Control District, Flood Hazard Area Delineation Report on the South Platte River, Sand Creek at Oxford Avenue, prepared by Wright Water Engineers, Inc., Denver, Colorado, September 1985

68. Commerce City, Colorado, Preliminary Land Use Plan: 1975-2000, June 1976

69. Colorado Water Conservation Board, South Platte River, State of Colorado, Flood of May 1973, July 1974

70. Colorado State University, Report No. FER 59 RAS 39, Preliminary Report on Magnitude and Frequency of Floods from Small Watersheds in Semi-Arid Areas, R.A. Schleusener, G.L. Smith, and N. Yotsukura, Fort Collins, Colorado, 1959

71. Urban Drainage and Flood Control District and Colorado Water Conservation Board, Flood Hazard Area Delineation — South Platte River, Adams County, Colorado, prepared by Gingery Associates, Inc., Englewood, Colorado, September 1977

72. Urban Drainage and Flood Control District and Colorado Water Conservation Board, Flood Hazard Area Delineation — Sand Creek, March 1977

73. U.S. Department of the Army, Corps of Engineers, Omaha District, Special Flood Hazard Report to Revise Floodplain Information, Metropolitan Region, Denver, Colorado, Volume II, Sand, Toll Gate, and Lower Cherry Creeks, March 1977

74. National Oceanic and Atmospheric Administration, Precipitation-Frequency Atlas of the Western United States, Volume II, Colorado, 1973

75. U.S. Water Resources Council, Hydrology Committee, "Guidelines for Determining Flood Flow Frequency," Bulletin No. 17, March 1976

76. Department of Environmental Weather Service, Environmental Science Services Administration, Office of Hydrology, Special Studies Branch, Precipitation Frequency Values, October 1967

77. Colorado State University, Report No. CER 59 RAS 39, Preliminary Report on Magnitude and Frequency of Floods from Small Watersheds in Semi-Arid Areas, R. A. Schleusener, G.L. Smith, N. Yotsukura, Fort Collins, Colorado, May 1960

78. Colorado State University, Report No. CER 60 RAS 30, Proceedings for Estimating Peak Rates of Runoff in Eastern Colorado and Adjacent Areas, R.A. Schleusener, G.L. Smith, L.O. Grant, Fort Collins, Colorado, May 1960

79. Colorado Water Conservation Board, Colorado Water Resources Basic Data Release No. 27, Rainfall-Runoff Data from Small Watersheds in Colorado, June 1968 through September 1971, Denver, Colorado, 1972

80. Denver Regional Council of Governments and the Urban Drainage and Flood Control District, Rainfall/Runoff Information — Project REUSE, Leonard Rice, Consulting Water Engineers, Denver, Colorado, May 1972

81. "Bennett, CO." epodunk. No Post Date. 14 Apr. 2005. <http://www.epodunk.com/cgi-bin/genInfo.php?locIndex=9350>

82. "Adams County Climate." Adams County Website. No Post Date. 14 Apr. 2005. <http://www.co.adams.co.us/services/service/county/about_adams/climate.html>

83. Boyle Engineering Corporation. Colorado Urban Hydrograph Procedure Computer Program — PC Version (CUHPF/PC). Prepared for Urban Drainage and Flood Control District. 1985.

84. Boyle Engineering Corporation. UDSWM/PC Version. 1985.

85. Urban Drainage and Flood Control District, Flood Hazard Area Delineation South Platte River, Adams County, Colorado, prepared by CDM, Denver, Colorado, April 2005.

86. Urban Drainage and Flood Control District, Major Drainageway Planning, South Platte River in Adams County, Colorado, Phase B Report, prepared by Camp Dresser & McKee, Inc., Denver, Colorado, April 2002.

87. U.S. Department of the Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System Computer Program, Version 3.1.1, Davis, California, May 2003.

88. AzTec Consultants, Inc. 1998. Aerial Control and Permanent Monuments, Lower Box Elder Creek Mapping, December 18, 1998. Prepared for the Urban Drainage and Flood Control District.

89. Urban Drainage and Flood Control District, Flood Hazard Area Delineation for Lower Box Elder Creek Watershed, prepared by Wright Water Engineers, Inc., Denver, Colorado, September 2001.

90. U.S. Environmental Protection Agency, Water Supply and Water Resources Division. 2005. Storm Water Management Model Version 5.0. Cincinnati, OH: U.S. Environmental Protection Agency.

91. U.S. Department of the Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River Analysis System Computer Program, Version 4.0, Davis, California, March 2008.

92. Greiner Engineering. 1986. Flood Hazard Area Delineation, Big Dry Creek, Tanglewood Creek, North Cotton Creek, Middle Cotton Creek South Cotton Creek, Airport Creek, North Branch Airport Creek, North City Park Creek, South City Park Creek, South Branch Hylands Creek, Middle Branch Hylands Creek, North Branch Hylands Creek, Walnut Creek, countryside Creek, North Branch Walnut Creek. Prepared for Urban Drainage and Flood Control District and the City of Westminster. Revised December 1988.

93. Wright Water Engineers. 2012. Flood Hazard Area Delineation, Big Dry Creek. Prepared for Urban Drainage and Flood Control District, Adams County, and the Cities of Thornton and Westminster.

94. Urban Drainage and Flood Control District. 2008. LiDAR Topography with 2-foot Contour Intervals.

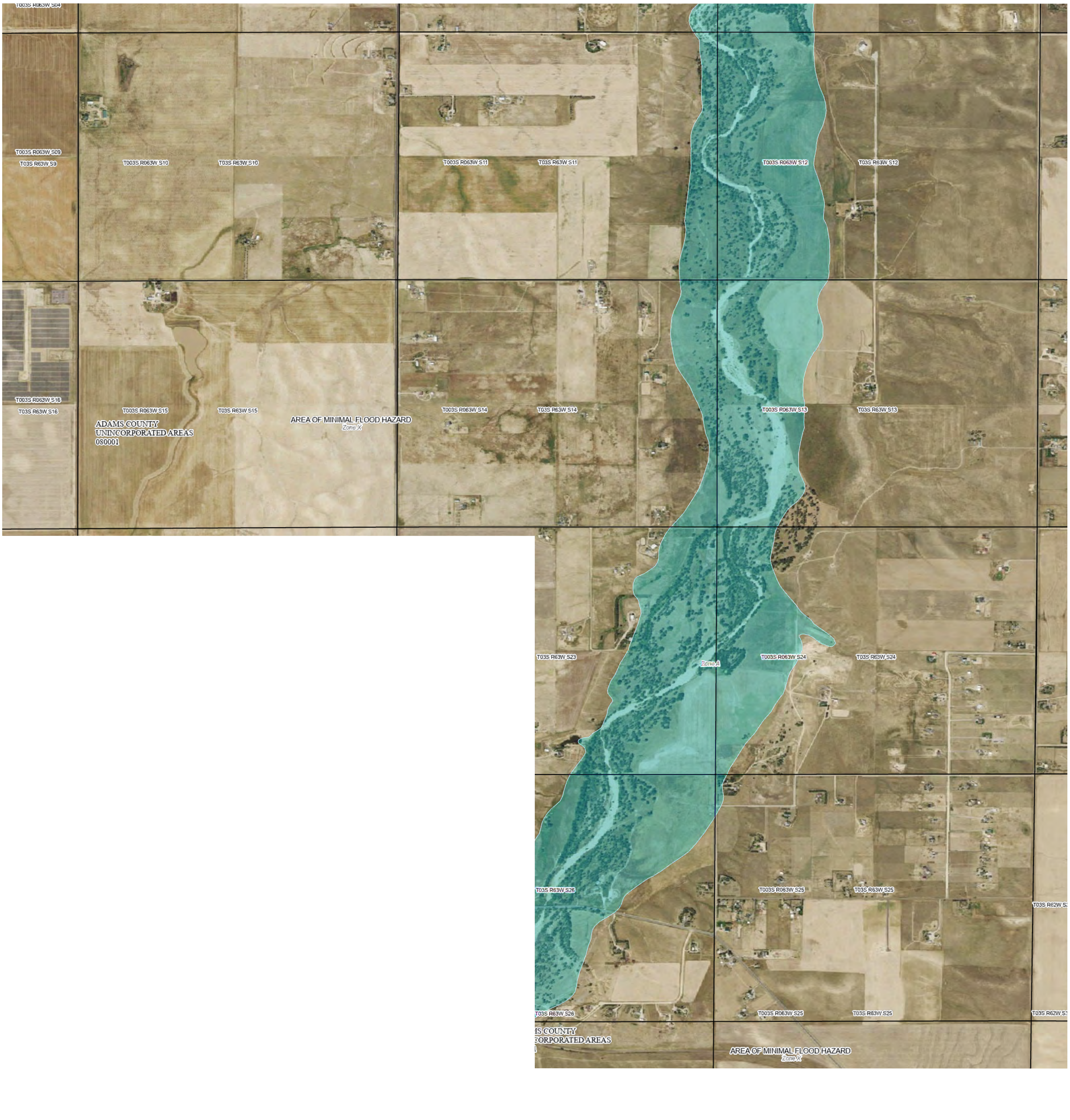
95. Moser Associates and Engineering, Flood Hazard Area Delineation First Creek (Upstream of Buckley Road), October 2011.

96. Matrix Design Group Inc., Flood Hazard Area Delineation Second (Upstream of Denver International Airport), Existing Conditions Flood Hazard Information developed with this study, May 2011.

97. Urban Drainage and Flood Control District, Box Elder Creek (Downstream of Jewell Avenue) and Coyote Run Flood Hazard Area Delineation, prepared by Olsson Associates, December 2014.

98. Urban Drainage and Flood Control District, Flood Hazard Area Delineation, Grange Hall Creek, prepared by RESPEC Consulting & Services, April 2019.

104°26'15.89"W 39°48'58.23"N



104°22'29.18"W 39°44'46.88"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

LINK> </CLR>for official maps and additional

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **8/19/2025 3:02 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: No elevation features on this FIRM
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 3,000 4,000 Feet

0 105 210 420 630 840 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL 720 OF 1080

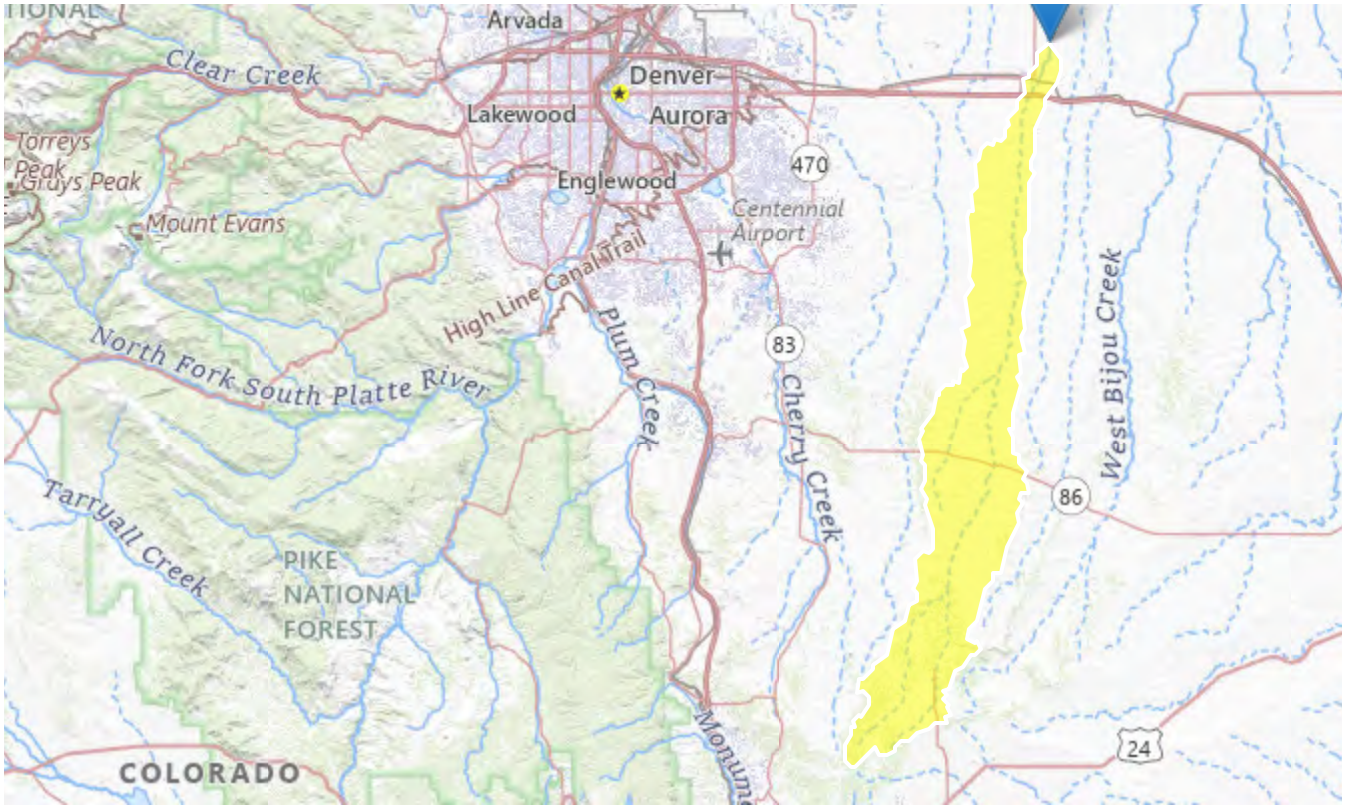
Panel Contains:

COMMUNITY	NUMBER	PANEL
ADAMS COUNTY	080001	0720

MAP NUMBER
08001C0720H
EFFECTIVE DATE
March 05, 2007

Kiowa Creek - StreamStats Report

Region ID: CO
Workspace ID: CO20250819221717076000
Clicked Point (Latitude, Longitude): 39.79403, -104.39522
Time: 2025-08-19 16:17:41 -0600



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	255	square miles
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3.77	inches
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	5339	feet
STATSCLAY	Percentage of clay soils from STATSGO	16.29	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	255	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3.77	inches	2.38	4.89
OUTLETELEV	Elevation of Gage	5339	feet	4290	8270
STATSCLAY	STATSGO Percentage of Clay Soils	16.29	percent	9.87	37.5

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	869	ft^3/s	117
20-percent AEP flood	2370	ft^3/s	87
10-percent AEP flood	4040	ft^3/s	80
4-percent AEP flood	7110	ft^3/s	80

Statistic	Value	Unit	ASEp
2-percent AEP flood	10200	ft^3/s	83
1-percent AEP flood	14200	ft^3/s	88
0.5-percent AEP flood	19000	ft^3/s	94
0.2-percent AEP flood	26700	ft^3/s	104

Peak-Flow Statistics Citations

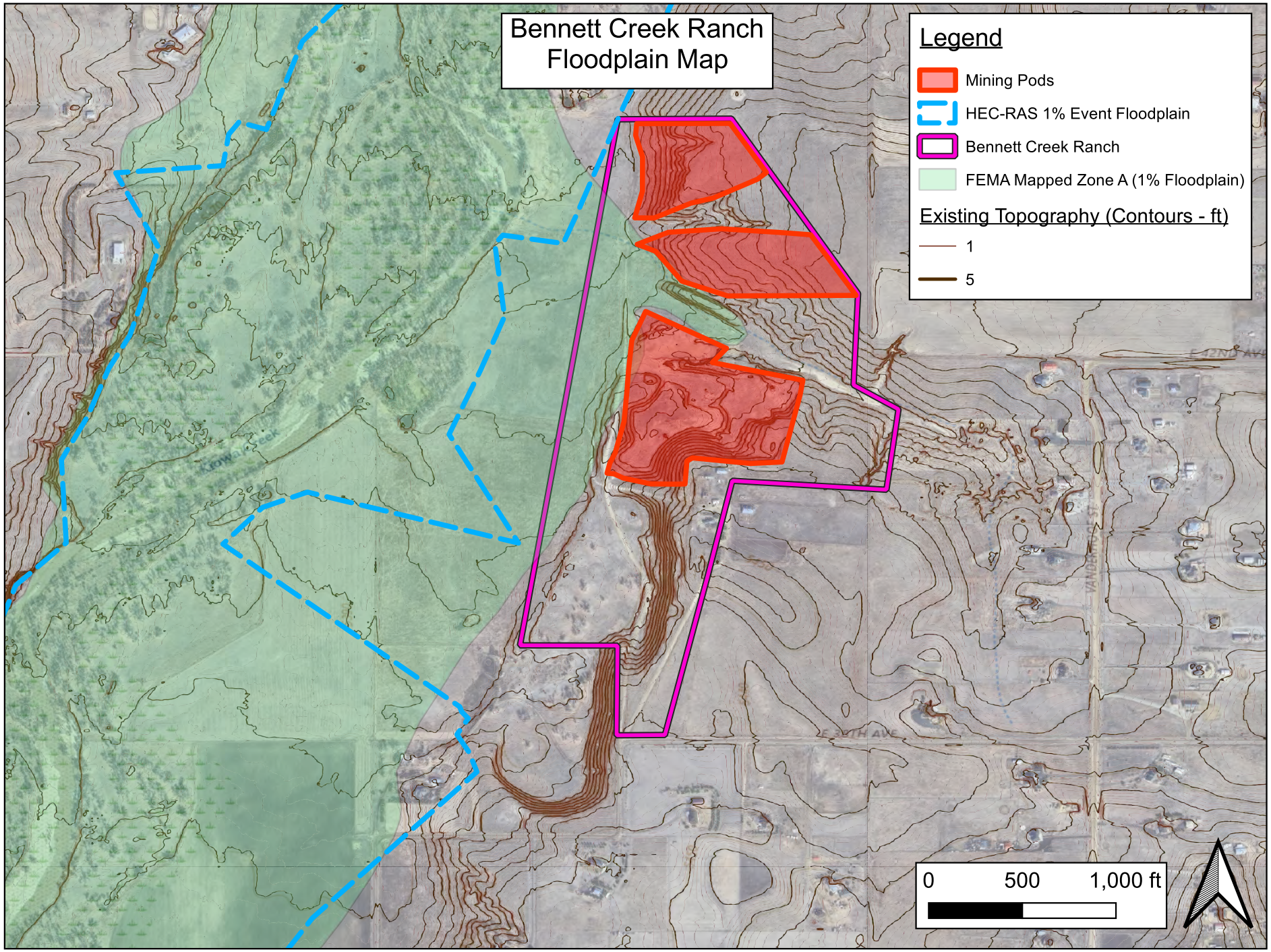
Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A.,2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (http://dx.doi.org/10.3133/sir20165099)

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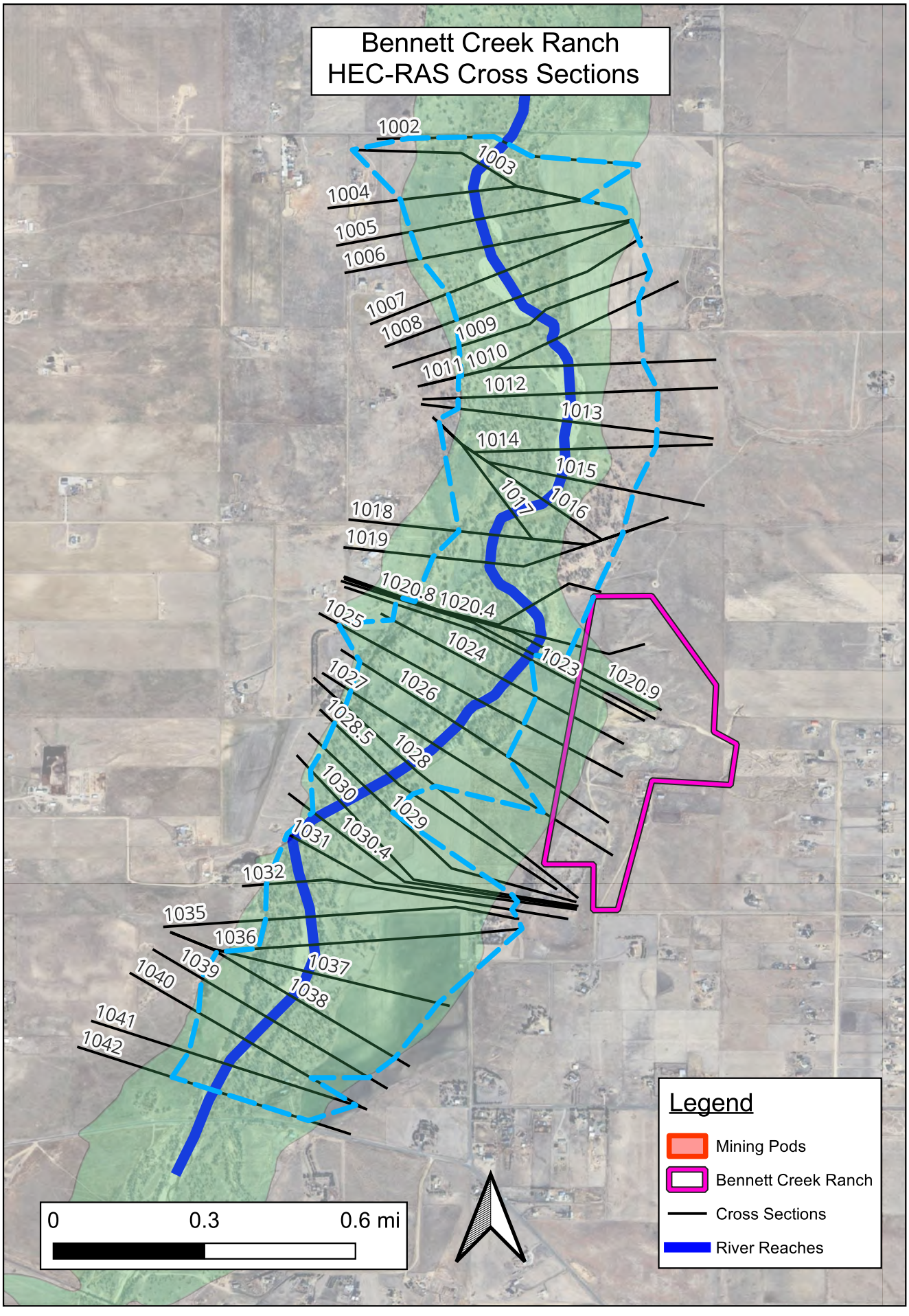
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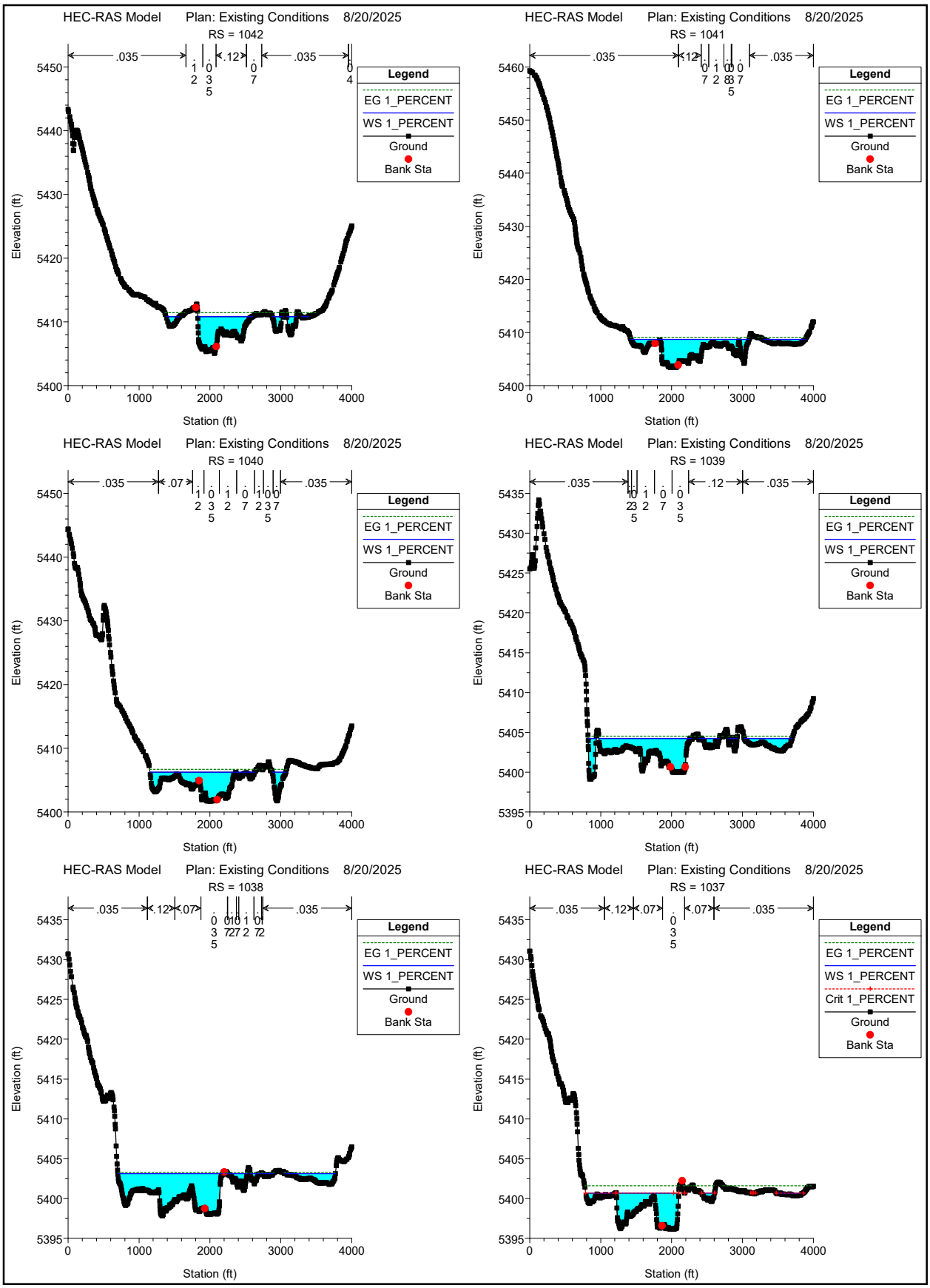
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StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

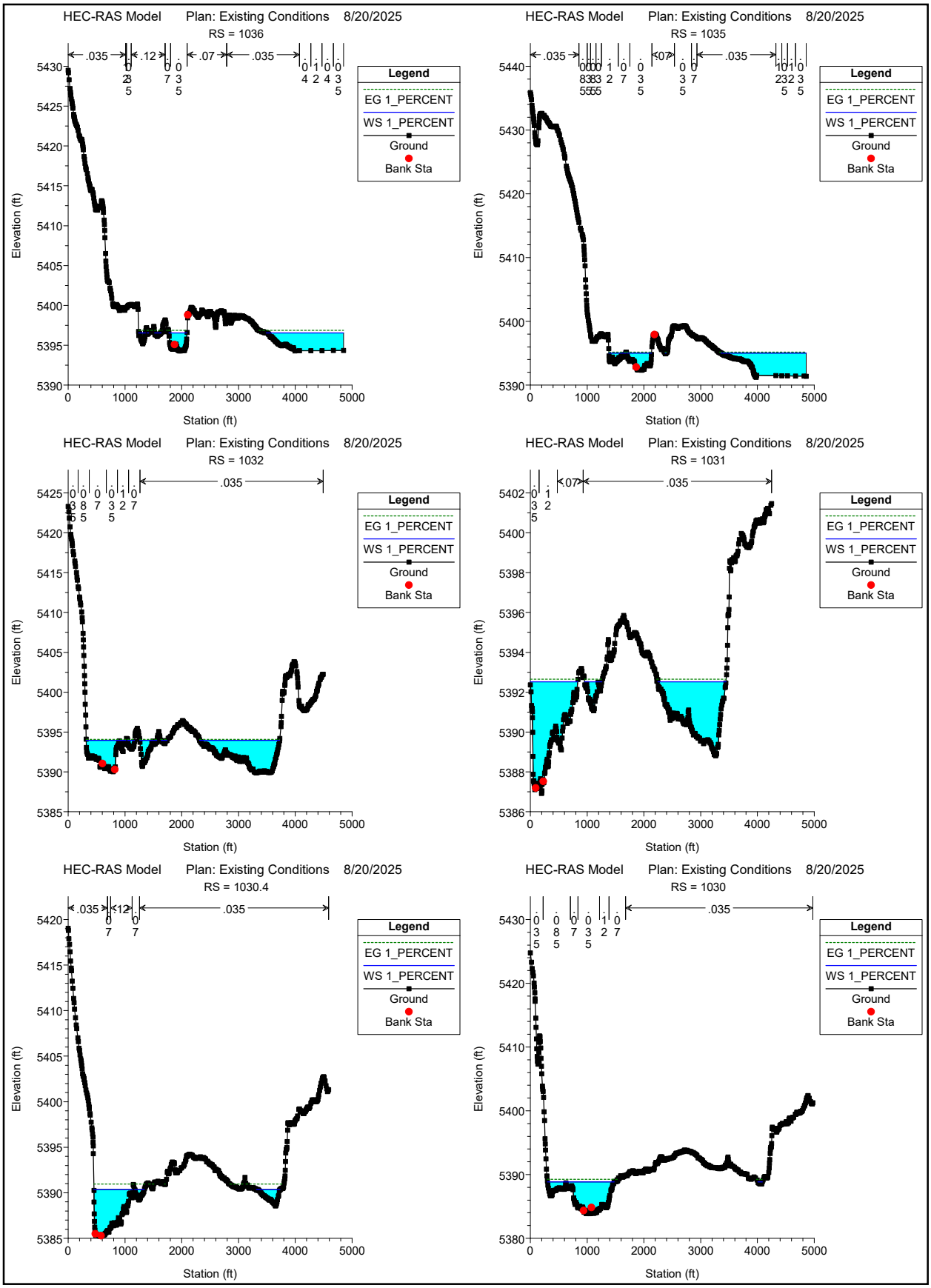

Bennett Creek Ranch
Floodplain Map
Legend
Mining Pods
HEC-RAS 1% Event Floodplain
Bennett Creek Ranch
FEMA Mapped Zone A (1% Floodplain)
Existing Topography (Contours - ft)
1
5
0
500
1,000 ft

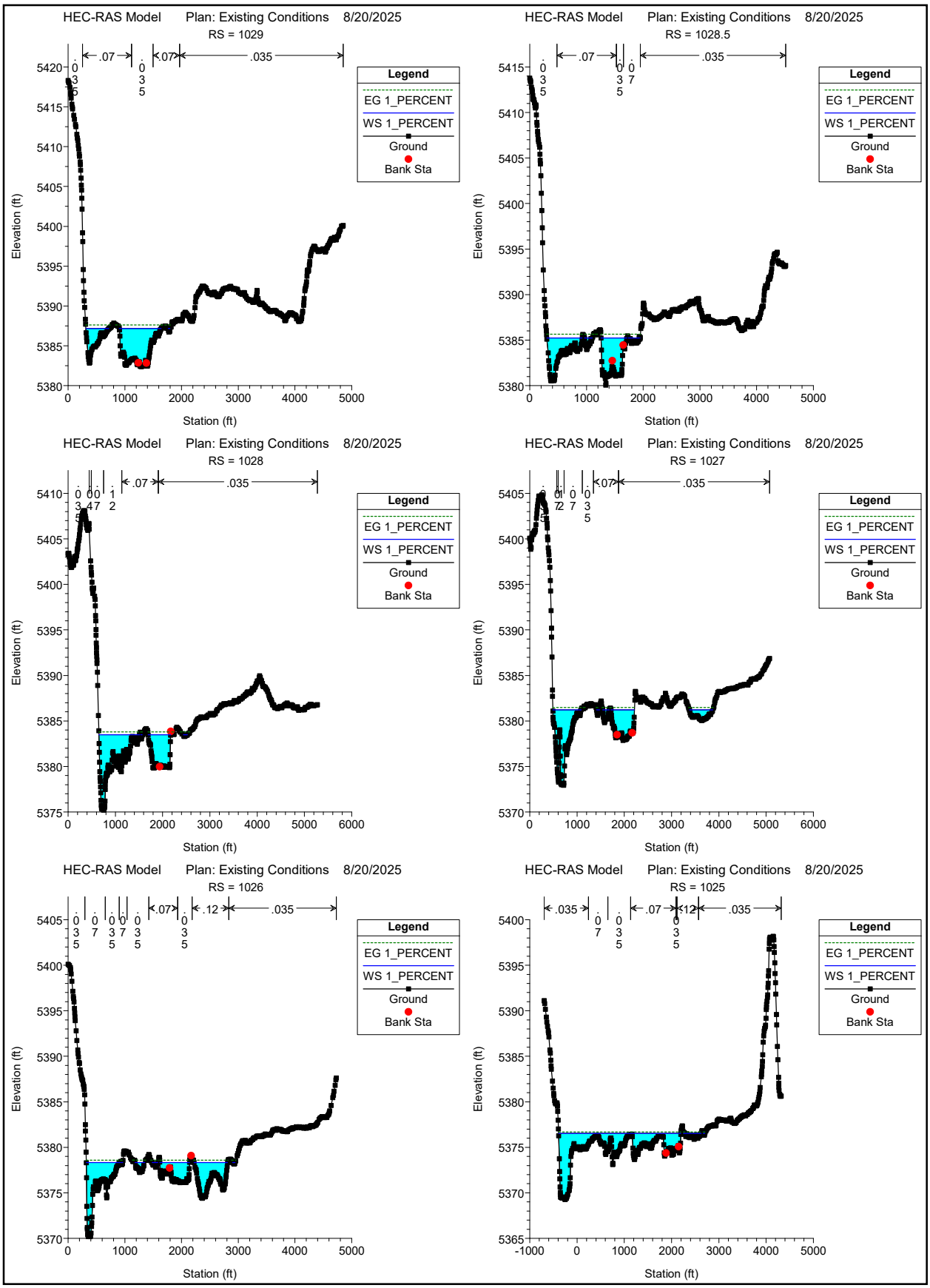
HEC-RAS Plan: Existing River: Kiowa Creek Reach: Kiowa_Crk Profile: 1_PERCENT

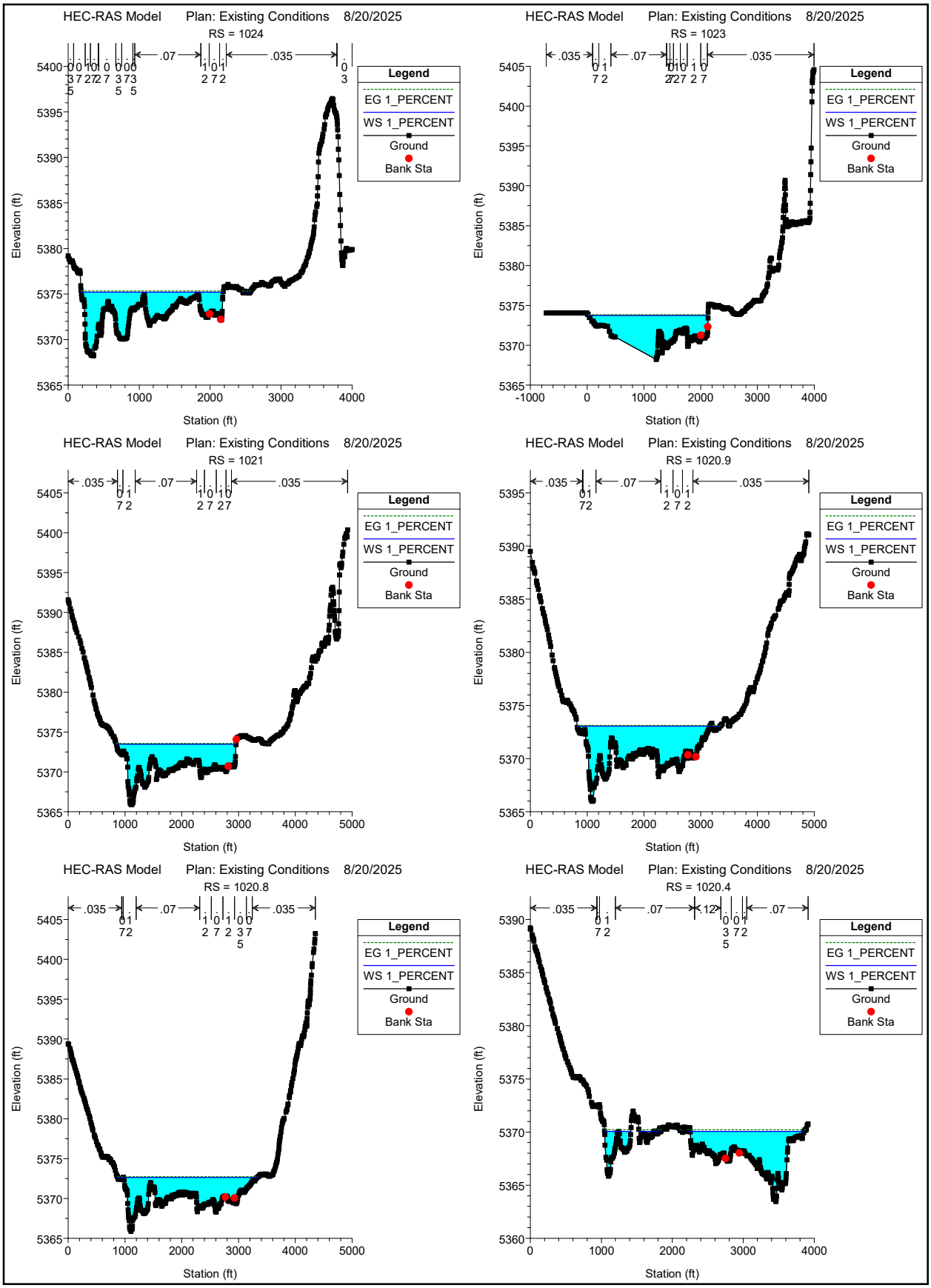
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Kiowa_Crk	1042	1_PERCENT	14200.00	5405.06	5410.81		5411.43	0.005121	7.46	3124.78	1340.02	0.59
Kiowa_Crk	1041	1_PERCENT	14200.00	5403.39	5408.71		5409.10	0.004105	6.47	4272.16	2262.91	0.60
Kiowa_Crk	1040	1_PERCENT	14200.00	5401.71	5406.24		5406.71	0.005734	7.12	3430.65	1663.46	0.63
Kiowa_Crk	1039	1_PERCENT	14200.00	5399.96	5404.23		5404.52	0.003353	6.08	4193.38	2489.21	0.53
Kiowa_Crk	1038	1_PERCENT	14200.00	5398.01	5403.12		5403.28	0.001818	4.73	5678.47	2746.56	0.41
Kiowa_Crk	1037	1_PERCENT	14200.00	5396.15	5400.69	5400.69	5401.60	0.007458	9.34	3015.64	1930.68	0.81
Kiowa_Crk	1036	1_PERCENT	14200.00	5394.29	5396.55		5396.86	0.006521	5.32	3254.94	1943.07	0.67
Kiowa_Crk	1035	1_PERCENT	14200.00	5392.36	5395.02		5395.16	0.002018	3.22	4933.26	2256.09	0.38
Kiowa_Crk	1032	1_PERCENT	14200.00	5390.03	5393.95		5394.06	0.001477	3.27	5461.19	2634.94	0.31
Kiowa_Crk	1031	1_PERCENT	14200.00	5386.91	5392.52		5392.65	0.002182	3.56	5190.68	2340.00	0.28
Kiowa_Crk	1030.4	1_PERCENT	14200.00	5385.23	5390.36		5390.96	0.005365	9.14	2881.22	1277.54	0.72
Kiowa_Crk	1030	1_PERCENT	14200.00	5383.85	5388.85		5389.25	0.003387	7.04	3265.32	1253.60	0.57
Kiowa_Crk	1029	1_PERCENT	14200.00	5382.38	5387.16		5387.61	0.004235	7.55	3070.71	1175.34	0.63
Kiowa_Crk	1028.5	1_PERCENT	14200.00	5381.04	5385.22		5385.65	0.006399	6.47	2911.92	1411.50	0.60
Kiowa_Crk	1028	1_PERCENT	14200.00	5379.86	5383.48		5383.79	0.004702	6.52	4048.97	1446.32	0.63
Kiowa_Crk	1027	1_PERCENT	14200.00	5377.86	5381.22		5381.48	0.004545	5.52	3917.50	1794.16	0.57
Kiowa_Crk	1026	1_PERCENT	14200.00	5376.11	5378.33		5378.59	0.007737	4.74	3991.10	2058.10	0.61
Kiowa_Crk	1025	1_PERCENT	14200.00	5374.14	5376.52		5376.68	0.002241	1.55	4864.88	2980.29	0.20
Kiowa_Crk	1024	1_PERCENT	14200.00	5372.21	5375.21		5375.33	0.003322	2.06	5243.19	2058.40	0.23
Kiowa_Crk	1023	1_PERCENT	14200.00	5370.84	5373.74		5373.82	0.002755	2.18	6255.19	2104.17	0.24
Kiowa_Crk	1021	1_PERCENT	14200.00	5370.59	5373.49		5373.56	0.002569	3.14	6674.41	2108.67	0.34
Kiowa_Crk	1020.9	1_PERCENT	14200.00	5370.07	5373.05		5373.12	0.002514	2.45	6877.95	2466.38	0.26
Kiowa_Crk	1020.8	1_PERCENT	14200.00	5369.46	5372.65		5372.74	0.003145	1.39	6470.69	2460.02	0.15
Kiowa_Crk	1020.4	1_PERCENT	14200.00	5367.26	5370.07		5370.22	0.005919	4.28	4871.33	2258.56	0.52
Kiowa_Crk	1019	1_PERCENT	14200.00	5363.62	5367.07		5367.14	0.001926	1.77	6782.60	2484.69	0.19
Kiowa_Crk	1018	1_PERCENT	14200.00	5362.18	5363.93	5363.79	5364.48	0.043249	5.68	2382.26	1664.12	0.83
Kiowa_Crk	1017	1_PERCENT	14200.00	5360.66	5362.84		5362.92	0.000940	0.82	6784.38	3061.04	0.11
Kiowa_Crk	1016	1_PERCENT	14200.00	5358.98	5362.16		5362.27	0.001944	1.60	5770.32	2568.52	0.17
Kiowa_Crk	1015	1_PERCENT	14200.00	5357.20	5361.13		5361.21	0.002318	2.87	6371.45	3004.95	0.27
Kiowa_Crk	1014	1_PERCENT	14200.00	5355.40	5359.18		5359.38	0.006714	4.41	4406.53	2683.81	0.43
Kiowa_Crk	1013	1_PERCENT	14200.00	5353.50	5357.04		5357.19	0.003087	4.24	5214.85	2542.25	0.42
Kiowa_Crk	1012	1_PERCENT	14200.00	5351.77	5355.20		5355.40	0.004297	4.91	5036.06	2683.02	0.49
Kiowa_Crk	1011	1_PERCENT	14200.00	5349.96	5353.27		5353.42	0.003684	3.76	4983.10	2468.10	0.38
Kiowa_Crk	1010	1_PERCENT	14200.00	5348.20	5351.06		5351.38	0.004562	4.03	3761.46	2255.05	0.55
Kiowa_Crk	1009	1_PERCENT	14200.00	5346.53	5347.63		5348.14	0.007648	3.21	2589.92	1644.86	0.65
Kiowa_Crk	1008	1_PERCENT	14200.00	5344.90	5345.98		5346.25	0.002559	1.75	3528.03	1596.76	0.36
Kiowa_Crk	1007	1_PERCENT	14200.00	5343.14	5345.03		5345.19	0.001697	2.36	4691.56	2289.39	0.33
Kiowa_Crk	1006	1_PERCENT	14200.00	5341.29	5343.55		5343.86	0.004728	4.55	3325.74	2289.08	0.57
Kiowa_Crk	1005	1_PERCENT	14200.00	5339.43	5342.44		5342.58	0.001530	3.23	4892.44	2530.06	0.35
Kiowa_Crk	1004	1_PERCENT	14200.00	5337.56	5340.39	5340.39	5340.92	0.010995	8.25	2754.59	2319.29	0.92
Kiowa_Crk	1003	1_PERCENT	14200.00	5335.72	5338.91		5339.05	0.001376	3.08	5102.64	2673.49	0.33
Kiowa_Crk	1002	1_PERCENT	14200.00	5333.56	5337.69	5337.05	5337.95	0.003877	6.16	4333.03	2960.75	0.58

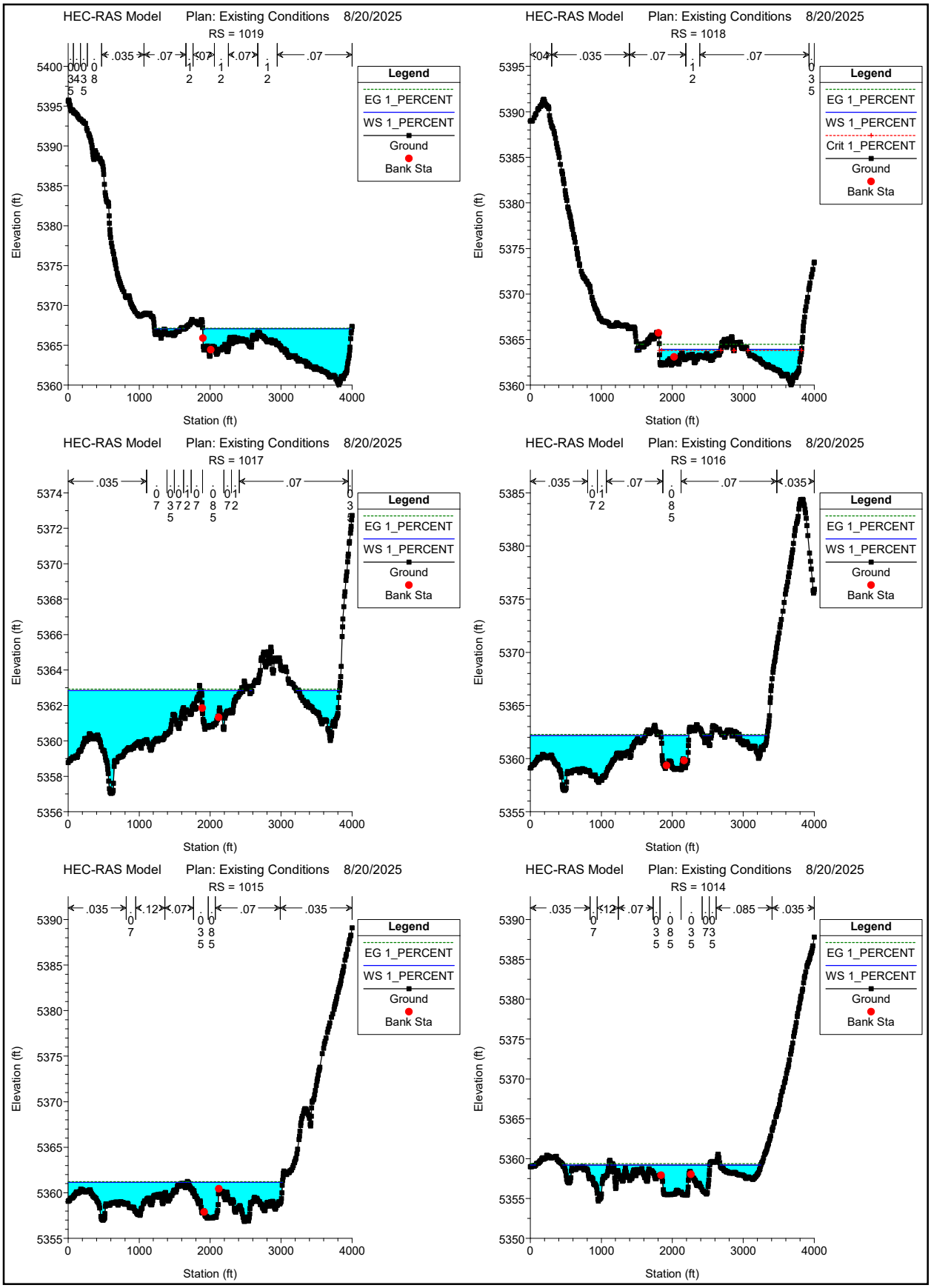

Bennett Creek Ranch
HEC-RAS Cross Sections
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
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1015
1016
1017
1018
1019
1020.8
1020.4
1020.9
1023
1024
1025
1026
1027
1028
1028.5
1029
1030
1030.4
1031
1032
1035
1036
1037
1038
1039
1040
1041
1042
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0.3
0.6 mi
Legend
Mining Pods
Bennett Creek Ranch
Cross Sections
River Reaches

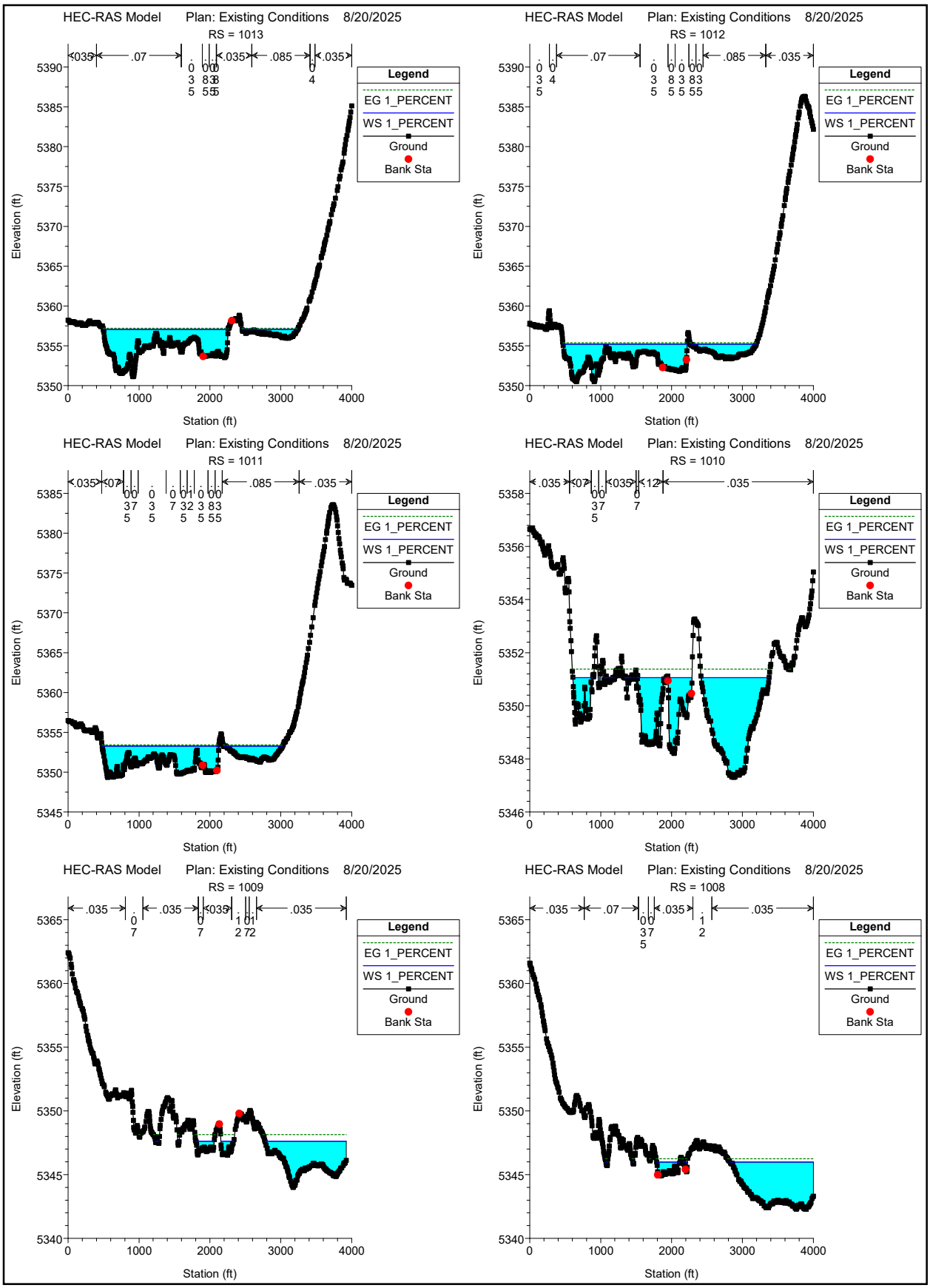

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WS 1_PERCENT
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Station (ft)
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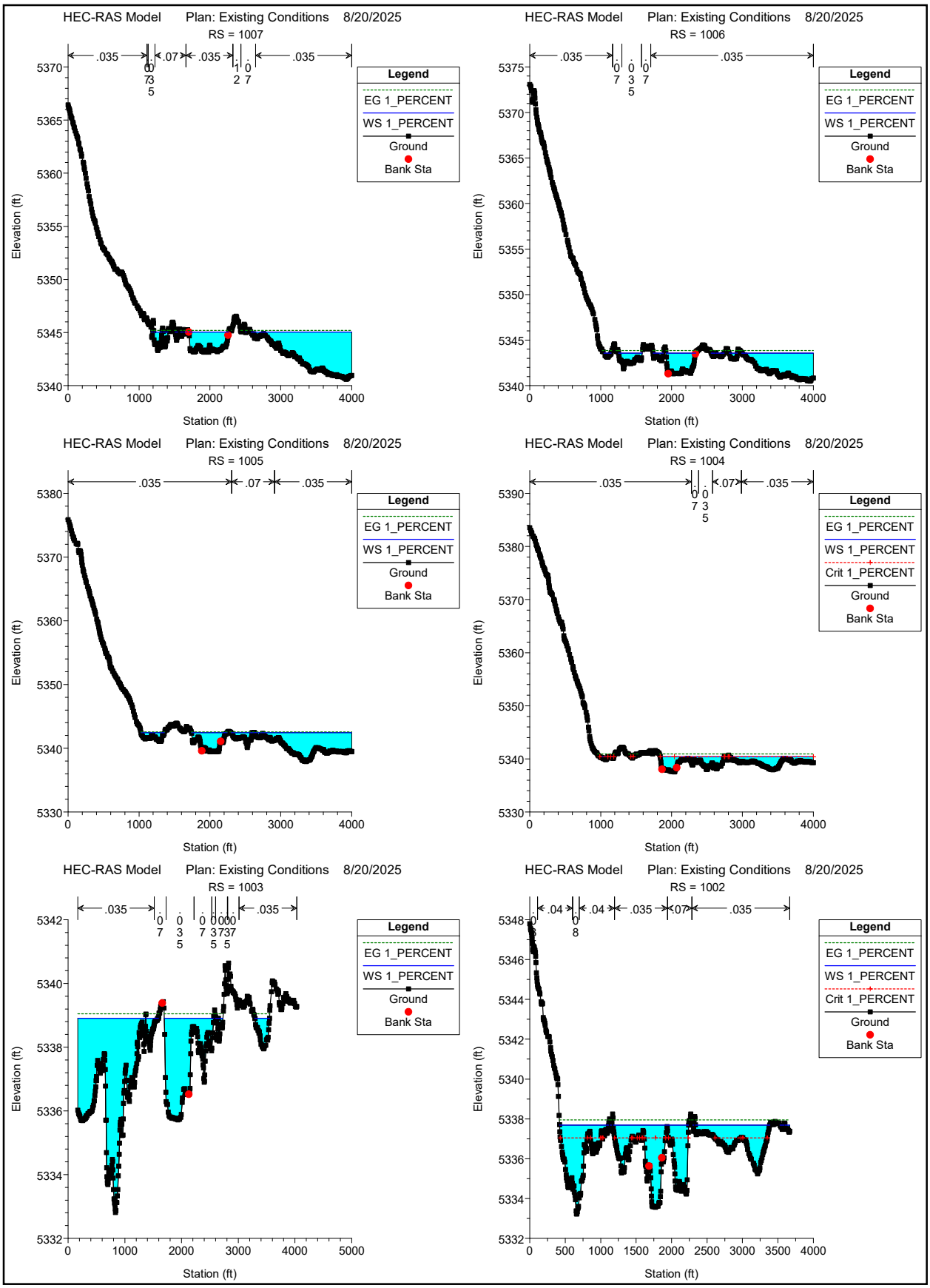

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Ground
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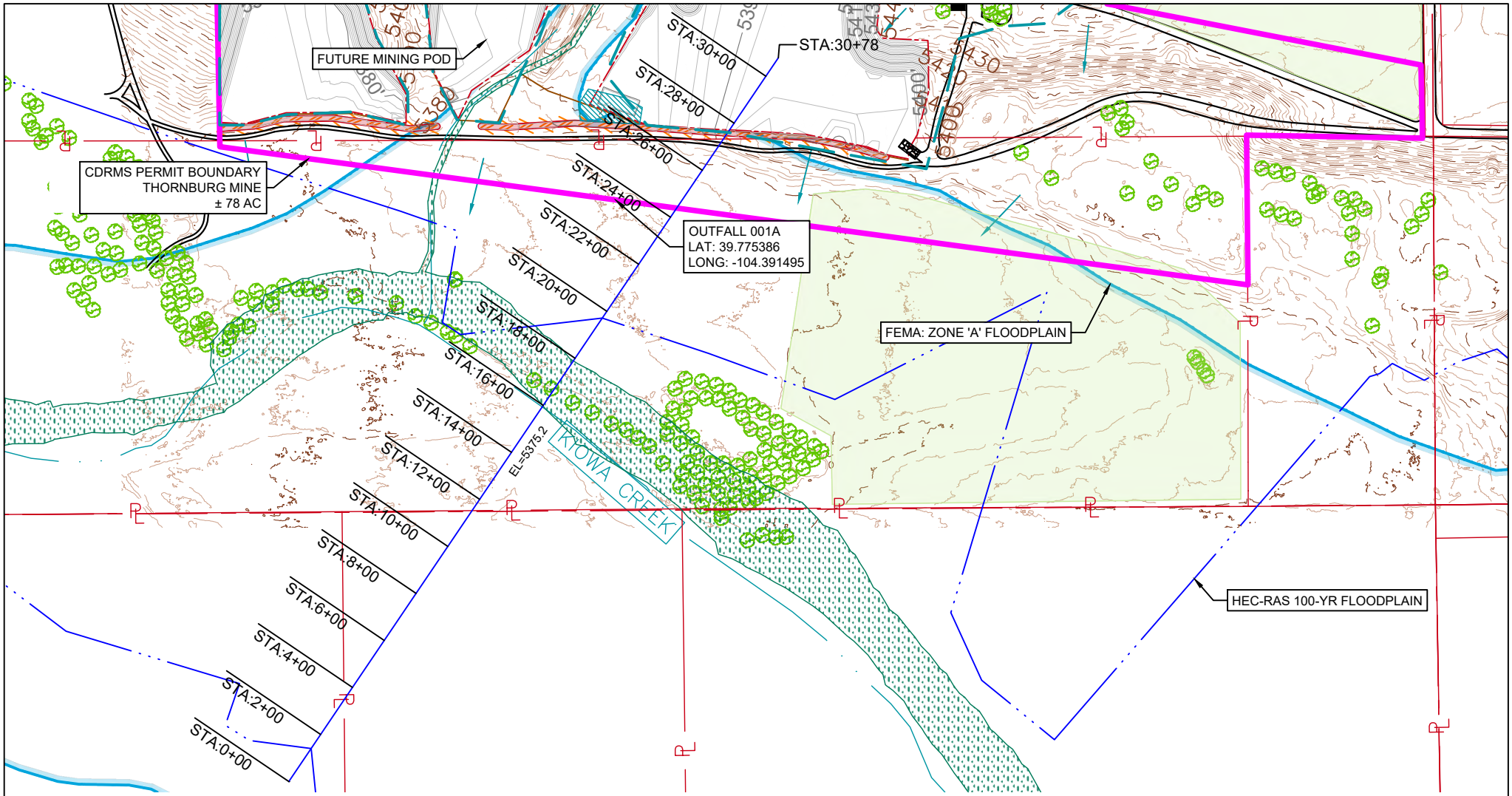

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Elevation (ft)
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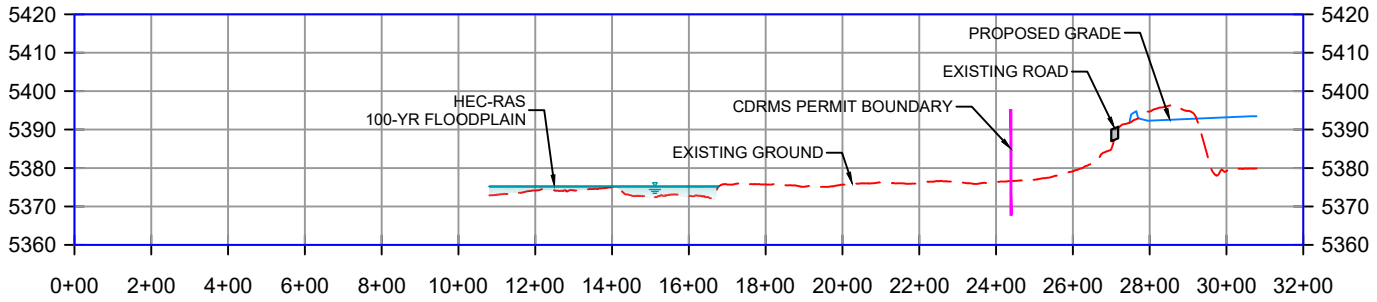

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Ground
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Station (ft)
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Ground
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Elevation (ft)
Station (ft)
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HEC-RAS Model Plan: Existing Conditions 8/20/2025
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Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Existing Conditions 8/20/2025
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RS = 1012
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RS = 1010
RS = 1009
RS = 1008
Legend
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WS 1_PERCENT
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Existing Conditions 8/20/2025
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.035 .07 .035 .035
Legend
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Ground
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Elevation (ft)
Station (ft)
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Elevation (ft)
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HEC-RAS Model Plan: Existing Conditions 8/20/2025
RS = 1005
.035 .07 .035
Legend
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WS 1_PERCENT
Ground
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Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Existing Conditions 8/20/2025
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.035 .07 .035
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Ground
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Elevation (ft)
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.035 .035
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WS 1_PERCENT
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Existing Conditions 8/20/2025
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.04 .04 .035 .07 .035
Legend
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WS 1_PERCENT
Crit 1_PERCENT
Ground
Bank Sta
Elevation (ft)
Station (ft)





HEC-RAS ALIGNMENT PROFILE

100-YR Floodplain Exhibit

Thornburg Pit

File Name: Thornburg Pit

DRMS Permit Number: M1983060

Bennett Creek Ranch LLC

Mine Entry Location: Latitude: ---- Longitude: ----

State: CO County: Adams Nearest Town: Bennett

Section: 24 Township: 3S Range: 63W PM: 6th

Major Watershed: Kiowa Creek

Map Scale: 1":500'

0 250' 500'

Map Geo. Info.: **Datum:** NAD83 **Projection:** CO CENTRAL

Survey Source: CO LIDAR Survey Date: 2013

Imagery Source: Google Imagery Date: 2024

Drawn by: LLD Date: 8/27/25

Checked by: BEL Date: 11/24/24

Approved by: BEL Date: 11/24/24

Lewicki & Associates

3375 West Powers Circle
Littleton, CO USA 80123

(303)-346-5196

info@lewicki.biz

FLOOD PLAIN USE PERMIT

Transmittal Items

Primary Mandatory Items

- [x] 1. Engineering Review Universal Application
- [ ] 2. Review fee (refer to fee schedule)
- [x] 3. Construction Plans/Documents (2 copies)
- [x] 4. Description of proposed improvements (2 copies)
- [x] 5. Compliance Statement

  *A commentary explaining how the proposed structure or action will be in compliance with the County & Federal Emergency Management Agency standards

Secondary Required Project Specific Items

- [ ] 1. Engineer's Structural Certification

  * A certification from a Professional Engineer registered in the State of Colorado stating the proposed structure, foundations & all structural elements are designed to withstand the static and hydrodynamic pressure of a 100-year flood.

- [ ] 2. Site Plan with the existing topography and proposed topography
- [ ] 3. Cross sections showing the 100-year water surface elevation, the proposed structure & the first floor elevation
- [ ] 4. Colorado Discharge Permit System Stormwater Construction Permit including Stormwater Management Plan
- [ ] 5. Elevation Certificate

  *Required after the structure is built, but prior to issuance of a Certificate of Occupancy

Community & Economic
Development Department
www.adcogov.org

ADAMS COUNTY
COLORADO

4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601-8204
PHONE 720.523.6800
FAX 720.523.6998

Engineering Review Application

Application Type:

☐ Construction Documents	☐ Subdivision
☐ Erosion and Sediment Control Plans	☐ Other _____

Have you attended a Conceptual Review? YES [✔] NO [ ]

If Yes, please list PRE#: [ ]

APPLICANT

Name(s): [ ] Company: [ ]

Address: [ ]

City, State, Zip: [ ]

Phone #: [ ] Email: [ ]

OWNER

Name(s): [ ] Phone #: [ ]

Address: [ ]

City, State, Zip: [ ]

2nd Phone #: [ ] Email: [ ]

TECHNICAL REPRESENTATIVE (Consultant, Engineer, Surveyor, Architect, etc.)

Name: [Ben Langenfeld] Company: [Lewicki & Associates]

Address: [3375 W Powers Circle]

City, State, Zip: [Littleton, CO 80123]

Phone #: [303 960 5613] Email: [benl@lewicki.biz]

DESCRIPTION OF SITE

Address:	
City, State, Zip:	
Area (acres or square feet):	
Tax Assessor Parcel Number	
Existing Zoning:	
Existing Land Use:	
Proposed Land Use:	

I hereby certify that I am making this application as owner of the above described property or acting under the authority of the owner (attached authorization, if not owner). I am familiar with all pertinent requirements, procedures, and fees of the County. I understand that the Application Review Fee is non-refundable. All statements made on this form and additional application materials are true to the best of my knowledge and belief.

Name: _____ Date: _____

Owner's Printed Name

Name: _____

Owner's Signature

LEGEND

BOUNDARIES

- DRMS Permit Boundary
- 200 ft Offset of DRMS Permit Boundary

BUILDINGS AND RELATED STRUCTURES

- Buildings
- Fence

LAND SURVEYS

- Section line
- Property Boundary
- Mining Claim

ROADS AND RELATED FEATURES

- Light duty road, gravel

RIVERS, LAKES, SHORELINES, AND CANALS

- Perennial stream/ditch
- Intermittent stream/ditch
- Drainage Basin Limits
- Drainage direction
- 100-Yr Floodplain

MINING FEATURES

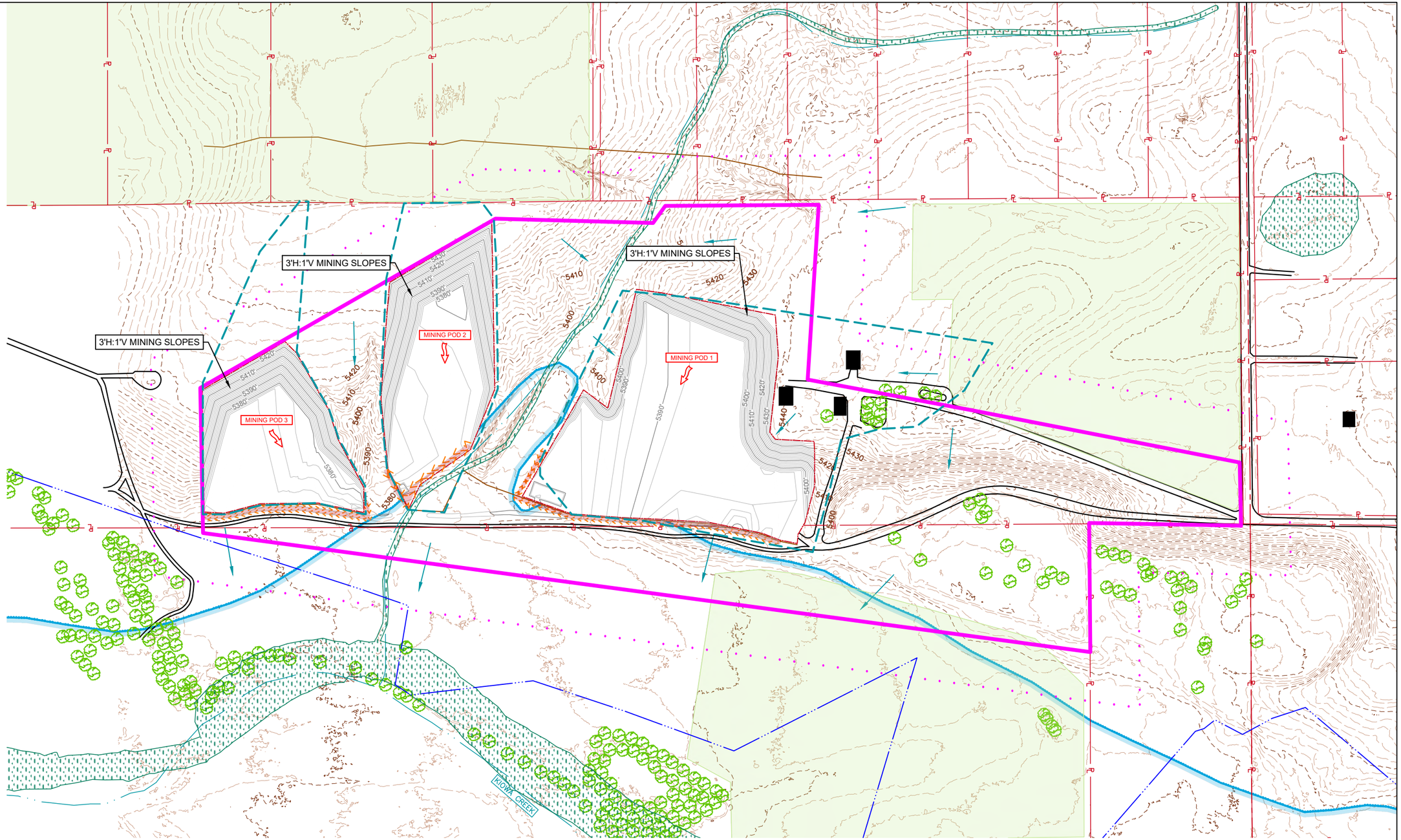
- Berm
- Berm/windrow
- Buried Water Structures

CONTOURS

- Existing Major Contour — 5280'
- Existing Minor Contour — 5281'
- Post-Mining Major Contour — 5280'
- Post-Mining Minor Contour — 5281'

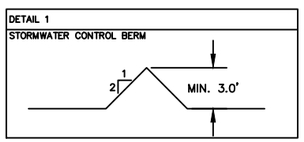
VEGETATION

- Agricultural Fields
- National Wetlands Inventory
- Existing Trees or Shrubs



DETAIL 1

STORMWATER CONTROL BERM



Grading Plan

Thornburg Pit

DRMS Permit Number: M1983060 — **Bennett Creek Ranch LLC**

Mine Entry Location:	Latitude: ---	Longitude: ---	
State: CO	County: Adams	Nearest Town: Bennett	
Section: 24	Township: 3S	Range: 63W	PM: 6th
Major Watershed:	Kiowa Creek		

Map Scale: 1" = 250'

0 — 250' — 500'

Map Georeferencing Information: Datum: NAD83 — Projection: CO CENTRAL

Survey Source: CO LIDAR	Drawn by: LLD	Date: 8/28/2025
Imagery Source: Google	Checked by: BEL	Date: 11/24/24
Survey Date: 2013	Approved by: BEL	Date: 11/24/24
Imagery Date: 2024		

File Name: Thornburg Pit

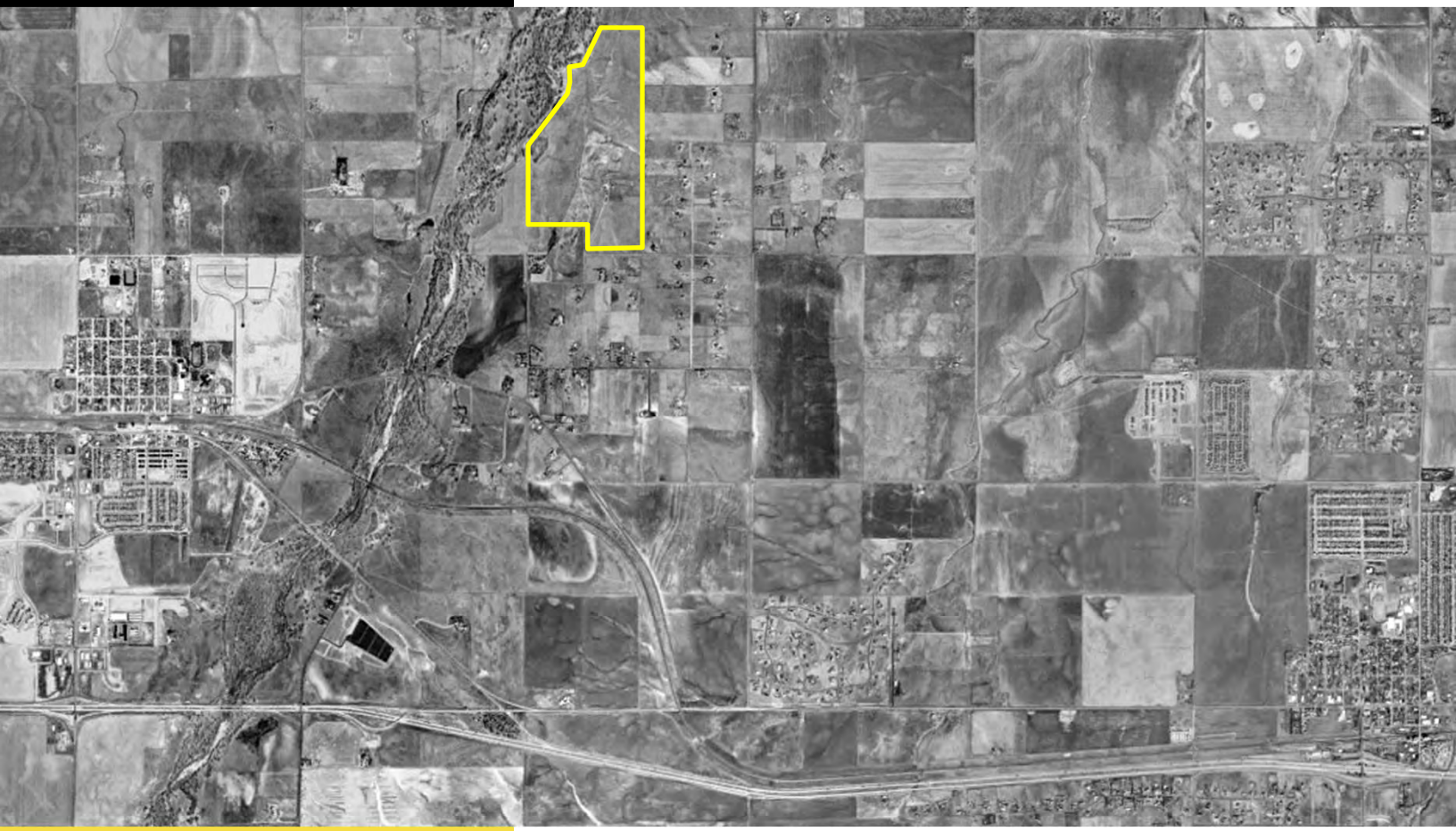
.\IMAGES\Basic Logo.png

3375 West Powers Circle
Littleton, CO USA 80123
(303)-346-5196
info@lewicki.biz

COLORADO LICENSED
BENJAMIN E LANGENFELD
47151
08/31/25
PROFESSIONAL ENGINEER

Bennett Creek Gravel Mine

Traffic Impact Study



Date: December 29, 2025

Submitted To:
LandDesign
3070 Blake Street, Suite 200
Denver, CO 80209

Submitted By:
Fox Tuttle Transportation Group, LLC
1580 Logan St, Suite 600 – PMB 0604
Denver, CO 80203

FOX TUTTLE

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Existing Traffic Data

Level of Service Definitions

Intersection Capacity Worksheets

BENNETT CREEK RANCH GRAVEL MINE PROJECT

TRAFFIC IMPACT STUDY

1.0 Introduction

Fox Tuttle Transportation Group has prepared this traffic impact study (TIS) for the Bennett Creek Ranch Gravel Mine (Bennett Creek) which is located in unincorporated Adams County, Colorado. The site is located at 50747 E 38th Avenue near Bennett, Colorado, and encompasses approximately +/- 300 acres. The property has operated as a gravel mine since 1983 and remains active today. No new facilities are proposed, and no change in land use is requested. The mining operation is requesting an extension of the expired Conditional Use Permit (CUP) from Adams County to allow operations to continue and expand. The Bennett Creek Mine includes one (1) access driveway on 38th Avenue on the southern side of the property. **Figure 1** provides a vicinity map for the proposed project and location relative to the Town of Bennett.

The purpose of this Level 3 TIS is to identify potential traffic impacts within the study area as a result of granting an extension of the requested CUP from Adams County. The traffic study addresses existing, short-term (Year 2026), and long-term (Year 2045) peak hour intersection conditions in the study area with and without the mining operation generated traffic. The information contained in this study is anticipated to be used by Adams County staff in identifying any intersection or roadway deficiencies and potential improvements for future conditions. This study focuses on the weekday AM and PM peak hours which represent the periods of highest traffic volumes on the adjacent streets.

2.0 Project Description

The Bennett Creek project anticipates up to 200 trucks to be on site per weekday between the hours of 6:00 AM and 6:00 PM, with trips assigned to one designated haul route. In addition to the trucks, Bennett Creek anticipates there will be four (4) employees on site daily; two for the morning shift and two for the afternoon shift. The gravel mining operation is anticipated to be operating at full capacity in Year 2026. The site will be accessed by one (1) driveway on the southern edge of the property frontage with 38th Avenue. **Figure 2** shows a conceptual site plan and proposed access for the project. At the time of this study, the County has asked that all truck traffic use the 38th Avenue and Yulle Road route to access the site.

3.0 Study Considerations

3.1 Data Collection

The study area includes three existing intersections, as listed in **Section 4.2**. Turning movement counts, including pedestrian and bicycle volumes, and daily traffic volumes were collected at all three (3) study intersections on Tuesday, December 2, 2025. In addition to the intersection counts, two (2) 24-hour volume data counts were collected on Old Victory Road just east of Provost Road, and on Yulle Road just south of 38th Avenue. All traffic count data are provided in the **Appendix**.

3.2 Evaluation Methodology

The traffic operations analysis evaluated both signalized and unsignalized intersections in accordance with the methodologies outlined in the *Highway Capacity Manual (HCM)*[1], using Synchro (Version 12) software. Existing Peak Hour Factors (PHFs) were applied to study intersections for all scenarios for a conservative analysis.

3.3 Level of Service Definitions

A level of service analysis is conducted to determine the existing and future performance of the study intersections and to identify any traffic control adjustments or mitigation measures that may be needed in the future.

To measure and describe the operational status of the study intersections, transportation engineers and planners commonly use a grading system referred to as "Level of Service" (LOS) that is defined by the HCM. LOS characterizes the operational conditions of an intersection's traffic flow, ranging from LOS A (indicating very good, free flow operations) and LOS F (indicating congested and sometimes oversaturated conditions). These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with traveling through intersections. The intersection LOS is represented as a delay in seconds per vehicle for the intersection as a whole and for each turning movement.

Typically, LOS A through C are considered to be acceptable for the overall intersection operations and LOS D overall during peak hours is acceptable. Individual movements may be allowed to fall to LOS E at signalized intersections by some jurisdictions. Minor movements at unsignalized intersections, such as left turns onto a major arterial, may be allowed to fall below LOS D, specifically where there are low volumes, signalization warrants not met, and/or no viable alternative. Criteria contained in the HCM were applied

[1] Highway Capacity Manual, Highway Research Board Special Report 209, Transportation Research Board, National Research Council, 7th Edition (2022).

for these analyses in order to determine peak hour LOS for each scenario. A more detailed discussion of the LOS methodology is contained in the **Appendix** for reference.

4.0 Existing Conditions

4.1 Roadways

The study area boundaries are based on the amount of traffic to be generated by the project and potential impact to the existing roadway network. Roadway classifications are defined in the *Adams County Transportation Master Plan, 2022*. The primary public roadways that serve the project site are discussed in the following text and illustrated in **Figure 1**.

E 38th Avenue is a two-lane east-west Minor Arterial roadway providing direct access to the site. In the site vicinity, the roadway is unpaved and does not have sidewalks or bicycle facilities. The speed limit is assumed to be 40 mph.

Yulle Road is a two-lane north–south Minor Arterial roadway east of the project site that connects E 38th Avenue to E Colfax Avenue (US 36). The roadway is paved, has gravel shoulders, and no pedestrian or bicycle facilities. The posted speed limit is 40 mph.

Provost Road is a two-lane north–south Local county roadway west of the site that connects E 38th Avenue to Old Victory Road. The roadway is paved, with unpaved shoulders and no pedestrian facilities or bicycle facilities. The posted speed limit is 30 mph just north of Old Victory Road.

Old Victory Road is a two-lane north–south Collector roadway that provides connection between Provost Road and I-70. The roadway is paved with gravel shoulders and no pedestrian facilities or bicycle facilities. The posted speed limit is 45 mph.

4.2 Intersections

The study area includes three (3) intersections that are listed below with the current traffic control and were analyzed for existing and future background year traffic operations:

1. Old Victory Road and Provost Road (side-street stop-controlled)
2. E 38th Avenue and Site Access (side-street stop-controlled)
3. E 38th Avenue and Yulle Road (side-street stop-controlled)

The existing lane configuration at each of the study locations is illustrated on **Figure 3**.

4.3 Pedestrian and Bicycle Facilities

The gravel mining site is located in a rural area where no pedestrian or bicycle facilities are present. According to the *Adams County Transportation Master Plan, 2022*, Old Victory Road is a Tier 1 (High Priority Missing Sidewalks) roadway, E 38th Avenue is a Tier 3 (Low Priority Missing Sidewalks) roadway, and Yulle Road and Provost Road do not require sidewalks. None of the roadways within the study area are identified in future bicycle network upgrades, however, the *Town of Bennett Master Transportation Plan, 2023*, identifies a future multimodal trail along Old Victory Road.

4.4 Transit

The *Town of Bennett Master Transportation Plan, 2023*, does identify several future Potential Transit Park and Ride Locations, but there are currently no existing transit facilities within the project limits as the gravel mining site is located outside of the Regional Transportation District (RTD) service boundary.

4.5 Existing Intersection Capacity Analysis

The existing volumes, lane configuration, and traffic control are illustrated in **Figure 3**. The results of the LOS calculations for the study intersections are summarized in **Table 1**. The 95th percentile queues are summarized in **Table 2**. The intersection LOS worksheets and 95th percentile queue reports are attached in the **Appendix**.

Currently, the three (3) study intersections operate overall at a LOS A in both peak periods, with all individual movements operating at a LOS D or better. Queueing analysis indicates that 95th percentile queues for all movements are one vehicle or less.

5.0 Future Traffic Conditions

5.1 Annual Growth Factor and Future Volume Methodology

To forecast future peak hour traffic volumes, Fox Tuttle analyzed regional modeling outputs from the Denver Regional Council of Governments (DRCOG) Focus model for Year 2020 (base year) and Year 2050. Data points were available on Old Victory Road and E Colfax Avenue in the vicinity of the site. The average growth rate of these two (2) data points was 2.2% which was applied to the existing traffic volumes at the existing study intersections to estimate future short-term and long-term volumes. The Year 2026 background volumes are summarized on **Figure 4** and the Year 2045 background volumes are summarized on **Figure 5**.

No future roadway improvement projects were identified in the *Adams County Transportation Master Plan, 2022*.

5.2 Year 2026 Background Intersection Capacity Analysis

The study intersections were evaluated under Year 2026 background traffic conditions to assess short-term operations and identify any capacity constraints associated with forecasted growth. The projected background traffic volumes, lane configurations, and traffic control are illustrated in **Figure 4**.

The Level of Service criteria discussed previously was applied to the study area intersections to determine the impacts with the short-term background volumes. The details of LOS for each movement are provided on **Table 1**. The 95th percentile queues are summarized on **Table 2**. The intersection Level of Service worksheets are attached in the **Appendix**. This analysis assumed the existing signal timing at the signalized intersection would be optimized in the next three years.

Overall, the study intersections are projected to operate similarly to existing conditions, with all intersections operating at a LOS A in both peak periods, and all individual movements operating at a LOS D or better. Queueing analysis indicates that 95th percentile queues for all movements are one vehicle or less.

5.3 Year 2045 Background Intersection Capacity Analysis

The study intersections were evaluated under Year 2045 background traffic conditions to assess long-term operations and identify any capacity constraints associated with regional growth. The projected background traffic volumes, roadway geometry, and traffic control assumptions are illustrated in **Figure 5**.

The Level of Service criteria discussed previously was applied to the study area intersections to determine the impacts with the long-term background volumes. The results of capacity analysis are shown on **Table 1** with the overall LOS and for each movement. The 95th percentile queues are summarized on **Table 2**. The intersection Level of Service worksheets are attached in the **Appendix**.

Overall, intersection operations in the Year 2045 Background scenario are projected to operate similarly to the 2026 Background scenario, with all intersections operating at a LOS A in both peak periods. Queueing analysis indicates that 95th percentile queues for all movements are one vehicle or less.

6.0 Proposed Mine-Generated Traffic

6.1 Trip Generation

A trip generation estimate was prepared to characterize traffic associated with the proposed Bennett Creek Ranch Gravel Mining operation. The project proposes 200 trucks per day on site, with each truck making one inbound and one outbound movement. This results in 400 average daily truck trips (200

inbound and 200 outbound), as summarized in Table 3. Truck activity is anticipated to occur between 6:00 AM and 6:00 PM.

In addition to truck traffic, the site will have four (4) on-site employees, generating 8 daily vehicle trips (4 inbound and 4 outbound). AM and PM peak-hour trips were estimated by applying peak-hour factors to the daily totals to represent the portion of site traffic occurring during commuter peak periods. As shown in **Table 3**, the operation is assumed to generate 20 total trips in the AM peak hour (10 inbound, 10 outbound) and 20 total trips in the PM peak hour (10 inbound, 10 outbound) from truck activity, with employee trips added accordingly. The proposed project is expected to experience only new trips, also known as 'primary trips', as discussed below:

> Primary Trips. These trips are made specifically to visit the site and are considered "new" trips. Primary trips would not have been made if the project did not exist. Therefore, this is the only trip type that increases the total number of trips made on a regional basis.

The project is estimated to generate approximately 408 daily trips with 24 trips in the AM peak hour and 24 trips in the PM peak hour as detailed in **Table 3**.

6.2 Trip Distribution and Assignment

The estimated trip volumes presented in **Table 3** were distributed onto the study roadway network based on existing Adams County direction to the Gravel Mining Site to use E 38th Avenue and Yulle Road as the haul route for 100% of the trucks. Using this distribution assumption, the projected site traffic was assigned to the study area roadway network and singular access for the weekday AM and PM peak hour periods. The overall assumed distribution and site generated volumes are summarized on **Figure 6**.

7.0 Future Traffic Conditions with Mine Operations

This section summarizes the analysis of future traffic conditions with the addition of site-generated traffic from the Bennett Creek Ranch Gravel Mine. Vehicular and truck access to the mining operation will be provided via the existing full-movement driveway on E 38th Avenue.

7.1 Year 2026 Background + Project Intersection Capacity Analysis

Under the Year 2026 short-term scenario, the mining operation is assumed to be operational. Site-generated trips were added to the forecasted Year 2026 background volumes, as illustrated in **Figure 7**. LOS results for the study intersections are summarized in **Table 1**, and 95th percentile queues are summarized in **Table 2**.

The addition of project-generated traffic was estimated to have minimal impact on the operations of the study intersections compared to the background condition. Overall, the study intersections are projected to operate similarly to existing conditions, with all intersections operating at a LOS A in both peak periods, and all individual movements operating at a LOS D or better. Queueing analysis indicates that 95th percentile queues for all movements are one vehicle or less.

7.2 Year 2045 Background + Project Intersection Capacity Analysis

The Year 2045 with project scenario reflects long-term regional growth with full operation of the mining operation. Site-generated trips were added to the forecasted Year 2045 background volumes, as illustrated in **Figure 8.** LOS results are summarized in **Table 1**, and 95th percentile queues are presented in **Table 2**. Detailed LOS worksheets and queue reports are provided in the **Appendix**.

The addition of project traffic is expected to have little to no impact on overall intersection operations compared to the Year 2045 background condition. Intersection and movement LOS values remain consistent with the long-term background scenario. All intersections are projected to operate at a LOS A in both peak periods, and all individual movements operating at a LOS D or better. Queueing analysis indicates that 95th percentile queues for all movements are one vehicle or less.

8.0 Queueing Analysis

A queueing analysis was performed to evaluate whether 95th percentile queues would warrant auxiliary lanes or result in spillback that could impact upstream intersections or access points. **Table 2** summarizes the 95th percentile queue lengths for each scenario, as calculated in Synchro, using an assumed vehicle spacing of 25 feet per vehicle.

It is important to note that the 95th percentile queue length represents a value 1.65 standard deviations above the average queue. While this queue length is theoretically exceeded only 5% of the time, it may still not occur regularly in the field and should be interpreted as a conservative estimate.

As shown in **Table 2**, queue lengths at all study intersections and the proposed site access are projected to be reasonable. In addition, turning movements were subjected to Adams County Roadway Improvement Thresholds and the following were warranted:

- Old Victory Road and Provost Road
    - Eastbound Left-turn Lane (2026 Background Scenario for posted speed limit ≥ 40 mph and left turn movement ≥ 25 vph in the PM peak hour)

- E 38th Avenue and Yulle Road
    - Northbound Left-turn Lane (2026 Background + Project Scenario for posted speed limit ≥ 40 mph and left turn movement ≥ 25 vph in the AM peak hour)

9.0 Conclusion

The Bennett Creek Ranch Gravel Mining operation proposes up to 200 trucks and four (4) employees to be onsite per weekday with truck trips assigned to one designated haul route. The site will be accessed by one (1) driveway on the southern edge of the property frontage with E 38th Avenue.

Vehicular traffic volumes associated with the project were evaluated under existing conditions, short-term (Year 2026), and long-term (Year 2045) scenarios, both with and without the mining operation. The project is anticipated to generate approximately 408 daily vehicle trips, including 24 trips during the AM peak hour and 24 trips during the PM peak hour.

The analysis determined that the existing transportation network can accommodate the additional traffic generated by the project. All study intersections are expected to operate at acceptable levels of service under future conditions with the completion of the development.

Tables and Figures:

Table 1 – Peak Hour Intersection Level of Service Summary

Table 2 – Peak Hour 95th Percentile Queue Summary

Table 3 – Trip Generation Summary

Figure 1 – Vicinity Map

Figure 2 – Conceptual Site Plan

Figure 3 – Year 2025 Existing Traffic Volumes

Figure 4 – Year 2026 Background Traffic Volumes

Figure 5 – Year 2045 Background Traffic Volumes

Figure 6 –Trip Distribution and Assignment

Figure 7 – Year 2026 Background + Project Traffic Volumes

Figure 8 – Year 2045 Background + Project Traffic Volumes

Table 1 - Peak Hour Intersection Level of Service Summary

Intersection and Lanes Groups	Existing (Year 2025)				Background (Year 2026)				Background + Project (Year 2026)				Background (Year 2045)				Background + Project (Year 2045)			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Stop-Controlled																				
1. Old Victory Rd and Provost Rd	**3**	**A**	**2**	**A**	**3**	**A**	**2**	**A**	**3**	**A**	**2**	**A**	**3**	**A**	**2**	**A**	**3**	**A**	**2**	**A**
Eastbound Left+Through	*8*	*A*	*7*	*A*																
Eastbound Left					*8*	*A*	*7*	*A*	*8*	*A*	*7*	*A*	*8*	*A*	*8*	*A*	*8*	*A*	*8*	*A*
Eastbound Through					*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*
Westbound Through+Right	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*
Southbound Left+Right	*9*	*A*	*9*	*A*	*9*	*A*	*9*	*A*	*9*	*A*	*9*	*A*	*10*	*A*	*9*	*A*	*10*	*A*	*9*	*A*
2. E 38th Ave and Site Access	**8**	**A**	**4**	**A**	**7**	**A**	**4**	**A**	**8**	**A**	**6**	**A**	**7**	**A**	**4**	**A**	**8**	**A**	**6**	**A**
Westbound Left+Right	*9*	*A*	*9*	*A*	*9*	*A*	*9*	*A*	*9*	*A*	*9*	*A*	*9*	*A*	*9*	*A*	*10*	*A*	*9*	*A*
Northbound Through+Right	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*
Southbound Left+Through	*8*	*A*	*8*	*A*	*8*	*A*	*8*	*A*	*8*	*A*	*8*	*A*	*8*	*A*	*8*	*A*	*8*	*A*	*8*	*A*
3. E 38th Ave and Yulle Rd	**6**	**A**	**3**	**A**	**5**	**A**	**3**	**A**	**6**	**A**	**5**	**A**	**6**	**A**	**3**	**A**	**6**	**A**	**4**	**A**
Eastbound Left+Right	*10*	*A*	*9*	*A*	*10*	*A*	*9*	*A*	*10*	*A*	*9*	*A*	*10*	*B*	*9*	*A*	*10*	*B*	*9*	*A*
Northbound Left+Through	*8*	*A*	*7*	*A*	*8*	*A*	*7*	*A*					*8*	*A*	*7*	*A*				
Northbound Left									*8*	*A*	*7*	*A*					*8*	*A*	*7*	*A*
Northbound Through									*0*	*A*	*0*	*A*					*0*	*A*	*0*	*A*
Southbound Through+Right	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*	*0*	*A*

Table 2 - Peak Hour 95th Percentile Queue Summary

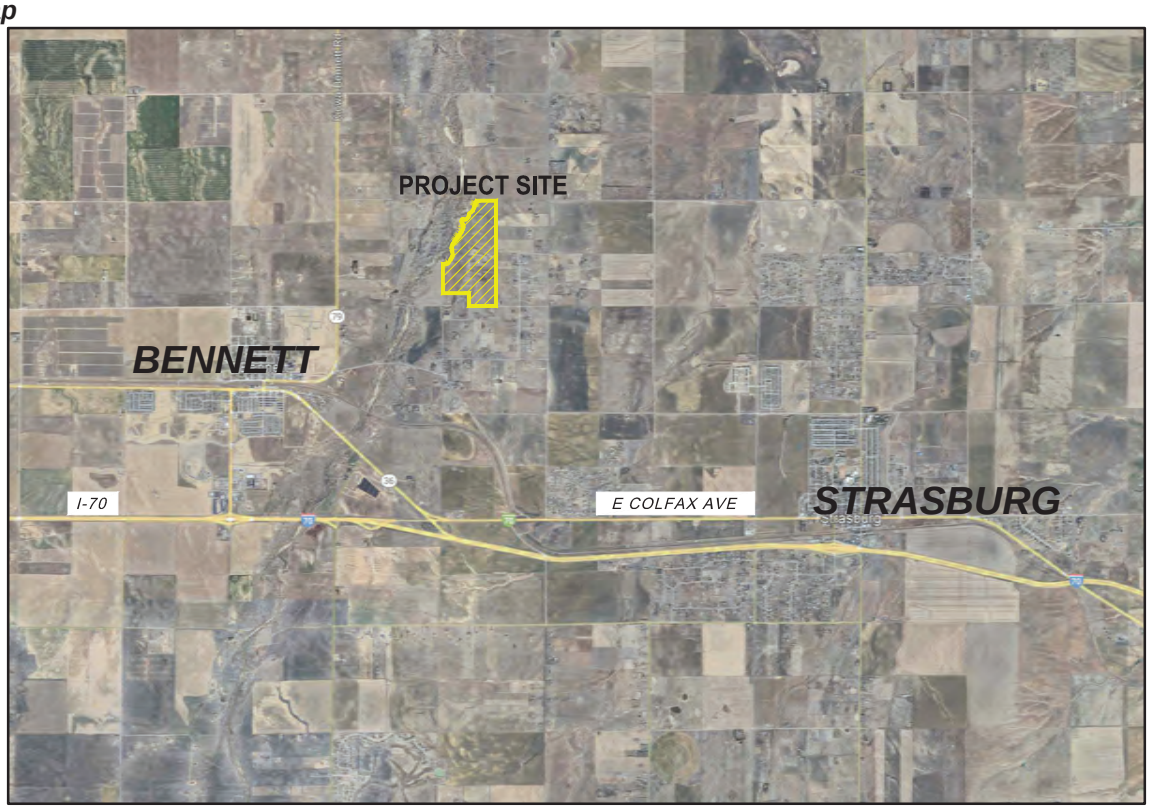
Intersection and Lanes Groups	Existing Storage	Existing (Year 2025)		Background (Year 2026)		Background + Project (Year 2026)		Background (Year 2045)		Background + Project (Year 2045)	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
1. Old Victory Rd and Provost Rd		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*	
Eastbound Left+Through	-	0'	3'								
Eastbound Left	-			0'	3'	0'	3'	3'	3'	3'	3'
Eastbound Through	-			0'	0'	0'	0'	0'	0'	0'	0'
Westbound Through+Right	-	0'	0'	0'	0'	0'	0'	0'	0'	0'	0'
Southbound Left+Right	-	3'	3'	3'	3'	3'	3'	5'	3'	5'	3'
2. E 38th Ave and Site Access		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*	
Westbound Left+Right	-	3'	0'	3'	0'	5'	3'	5'	3'	5'	3'
Northbound Through+Right	-	0'	0'	0'	0'	0'	0'	0'	0'	0'	0'
Southbound Left+Through	-	3'	0'	3'	0'	5'	3'	5'	0'	8'	3'
3. E 38th Ave and Yulle Rd		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*		*Side-Street Stop Controlled*	
Eastbound Left+Right	-	5'	0'	5'	3'	8'	3'	8'	3'	13'	3'
Northbound Left+Through	-	3'	0'	3'	0'			3'	0'		
Northbound Left	-					5'	0'			5'	3'
Northbound Through	-					0'	0'			0'	0'
Southbound Through+Right	-	0'	0'	0'	0'	0'	0'	0'	0'	0'	0'

Table 3 - Trip Generation

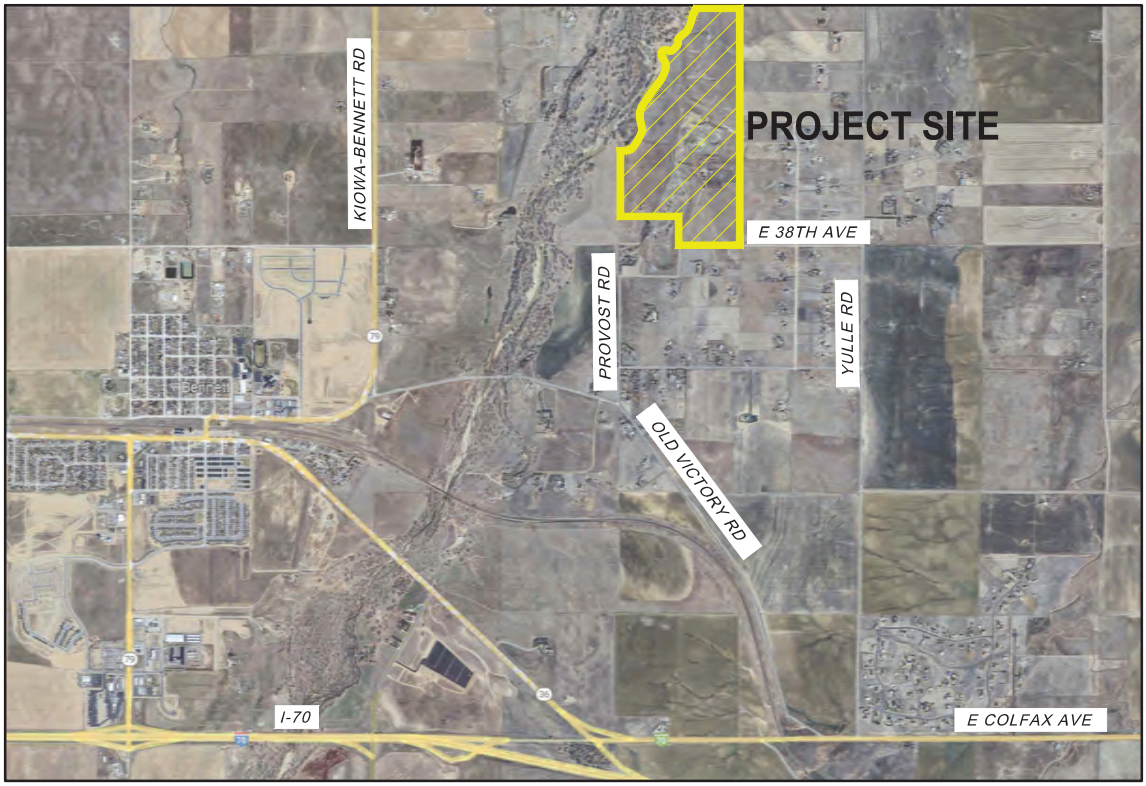
Land Use	Size	Unit	Weekday								
			Average Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
Gravel Mining Operation (Trucks)	300	Acres	400	200	200	20	10	10	20	10	10
Gravel Mining Operation (Employees)	4	Employees	8	4	4	4	2	2	4	2	2
		Total Site Trips	***408***	***204***	***204***	***24***	***12***	***12***	***24***	***12***	***12***

Source : Bennett Creek Ranch

Area Map



Location within Adams County



FOX TUTTLE
TRANSPORTATION GROUP

BENNETT CREEK RANCH GRAVEL MINE TRAFFIC IMPACT STUDY

VICINITY MAP

FT #	25081	Original Scale	NTS	Date	12/19/2025	Drawn by	CES	Figure #	1

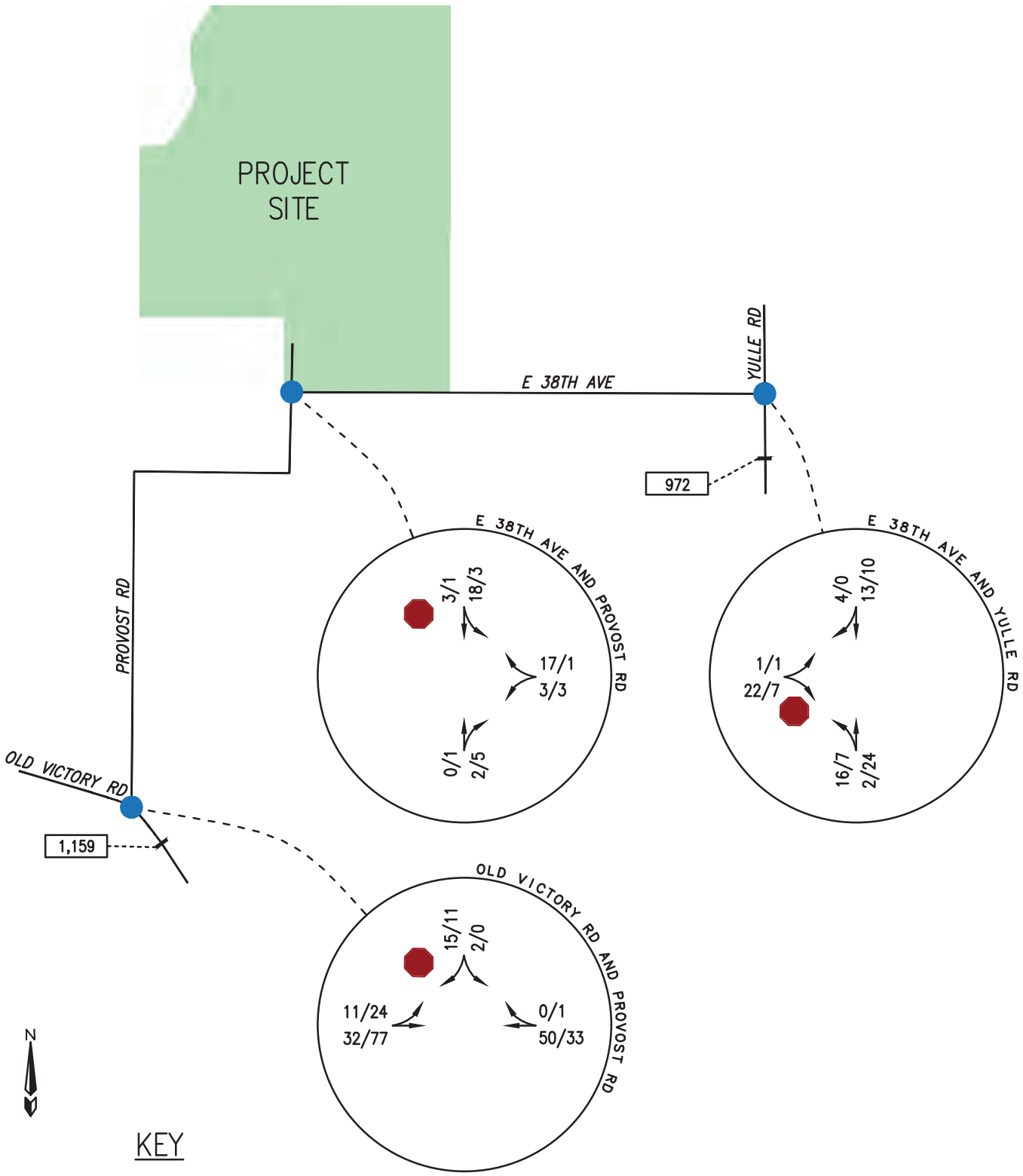


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TRANSPORTATION GROUP

BENNETT CREEK RANCH GRAVEL MINE TRAFFIC IMPACT STUDY

SITE ACCESS AND HAUL ROUTES

FT #	25081	Original Scale	NTS	Date	12/19/2025	Drawn by	CES	Figure #	2

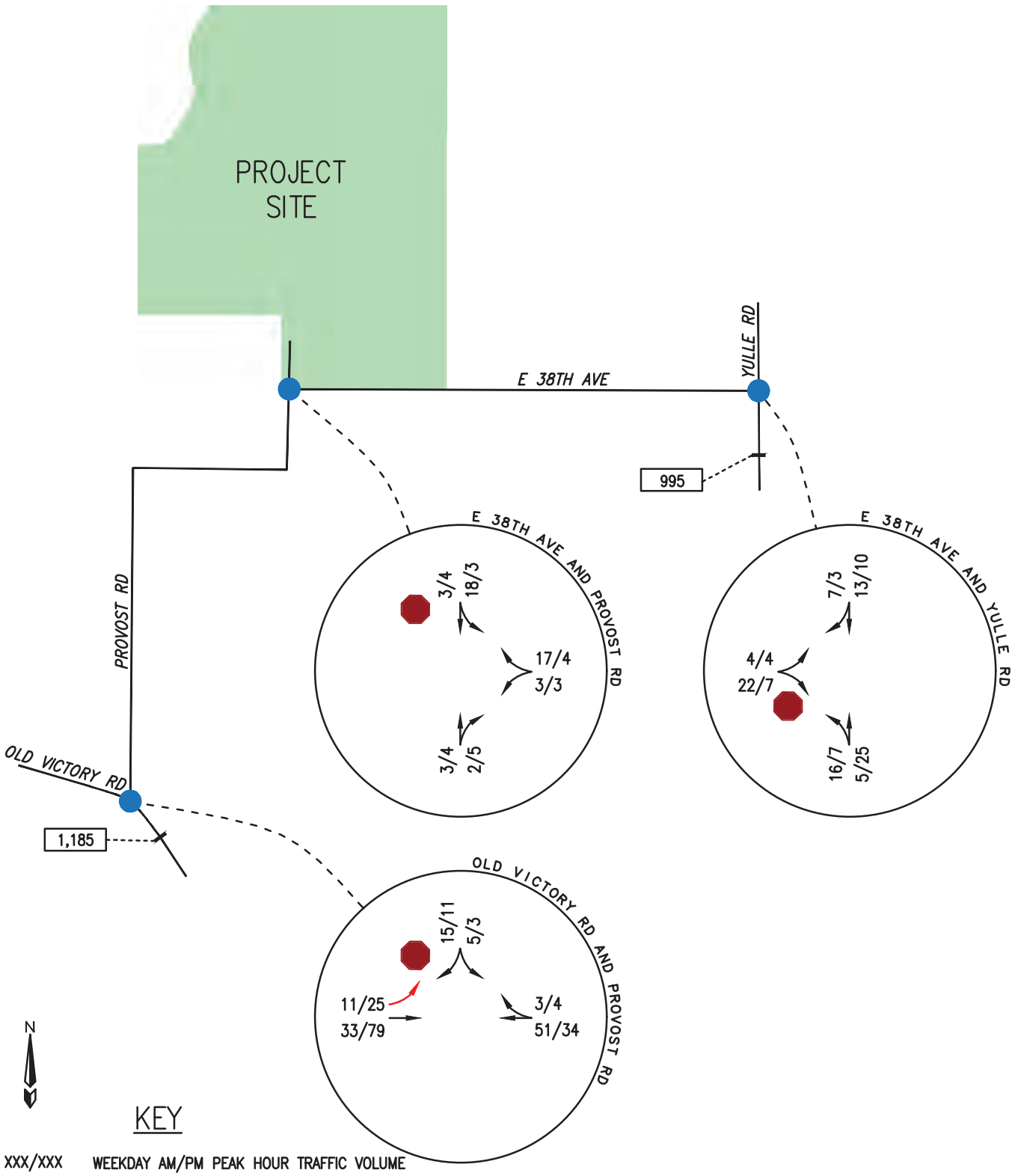


FOX TUTTLE TRANSPORTATION GROUP

BENNETT CREEK RANCH GRAVEL MINE TRAFFIC IMPACT STUDY

EXISTING TRAFFIC VOLUMES, GEOMETRY, AND TRAFFIC CONTROL

FT #	25081	Original Scale	NTS	Date	12/19/2025	Drawn by	CES	Figure #	3

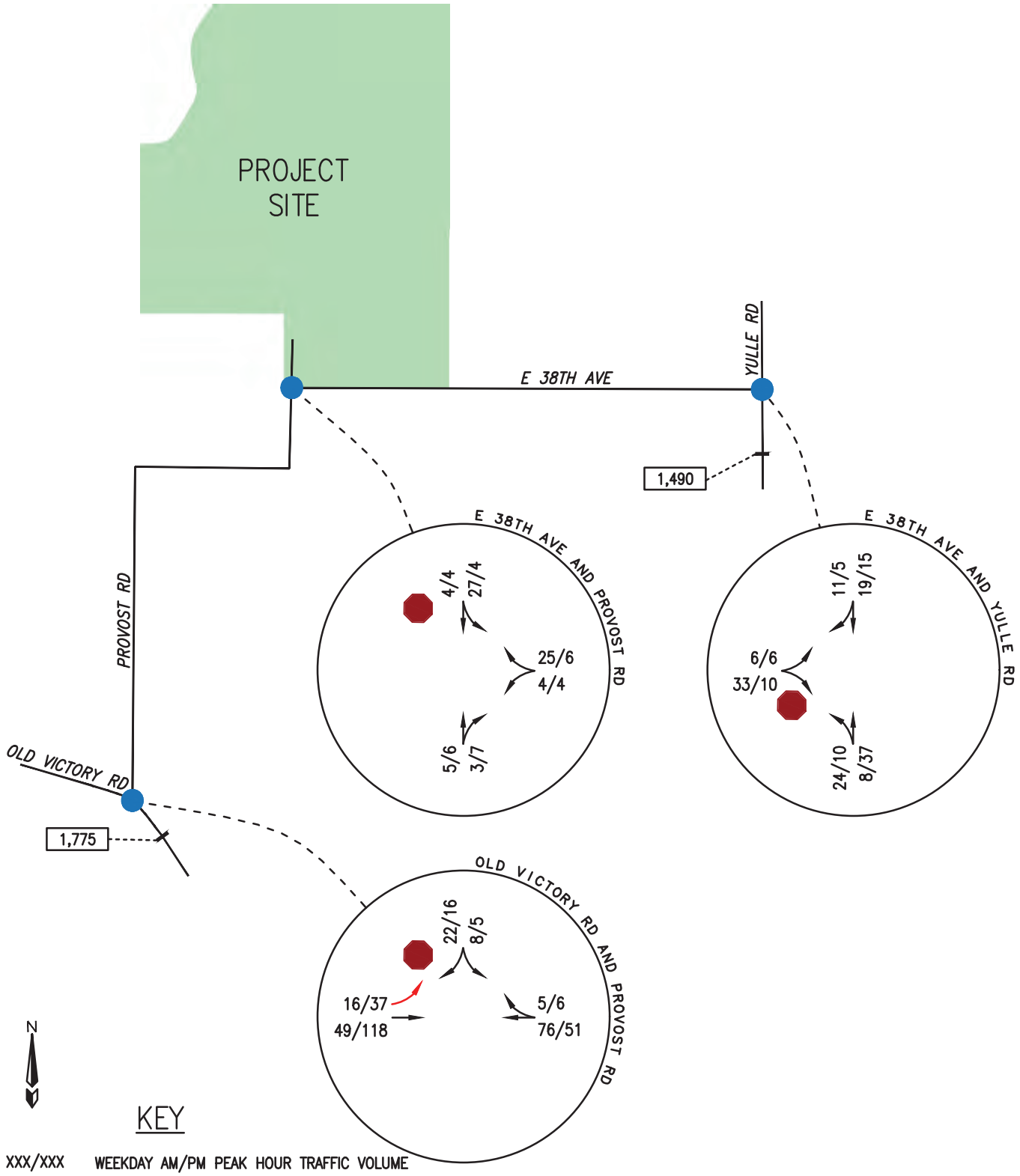


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BENNETT CREEK RANCH GRAVEL MINE TRAFFIC IMPACT STUDY

YEAR 2026 BACKGROUND TRAFFIC VOLUMES

FT #	25081	Original Scale	NTS	Date	12/29/2025	Drawn by	CES	Figure #	4

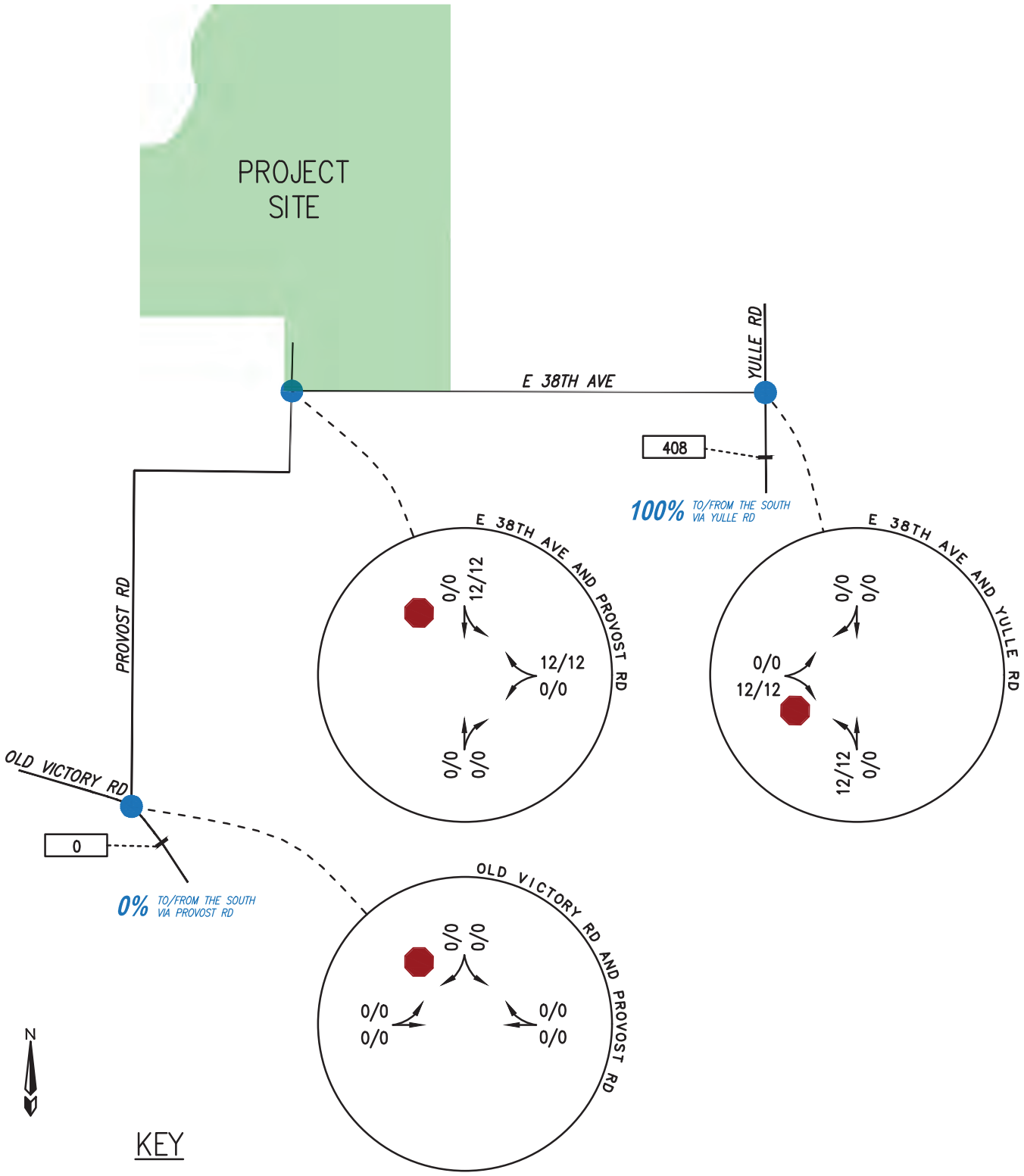


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BENNETT CREEK RANCH GRAVEL MINE TRAFFIC IMPACT STUDY

YEAR 2045 BACKGROUND TRAFFIC VOLUMES

FT #	25081	Original Scale	NTS	Date	12/29/2025	Drawn by	CES	Figure #	5

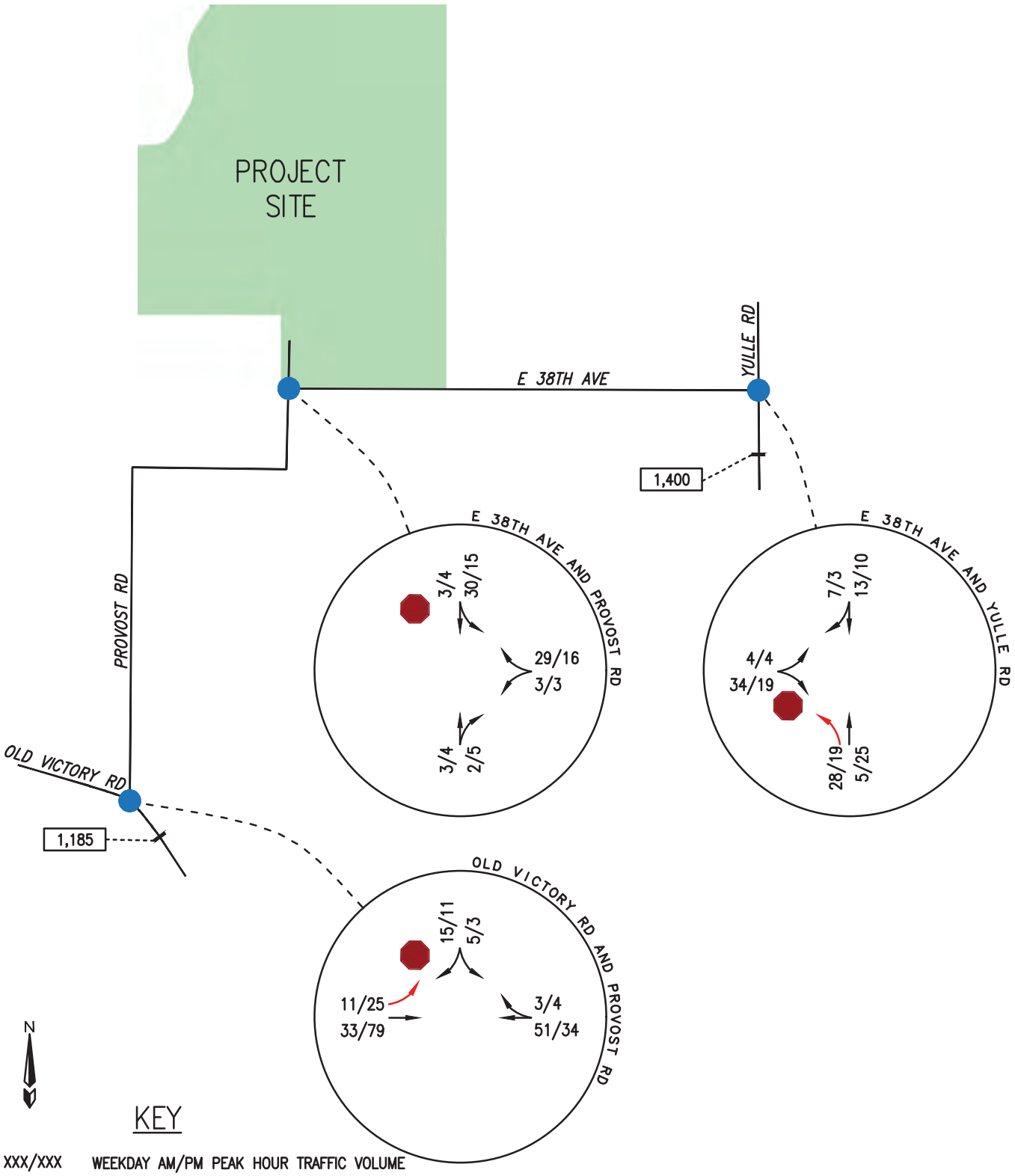


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BENNETT CREEK RANCH GRAVEL MINE TRAFFIC IMPACT STUDY

TRIP DISTRIBUTION AND ASSIGNMENT

FT #	25081	Original Scale	NTS	Date	12/19/2025	Drawn by	CES	Figure #	6

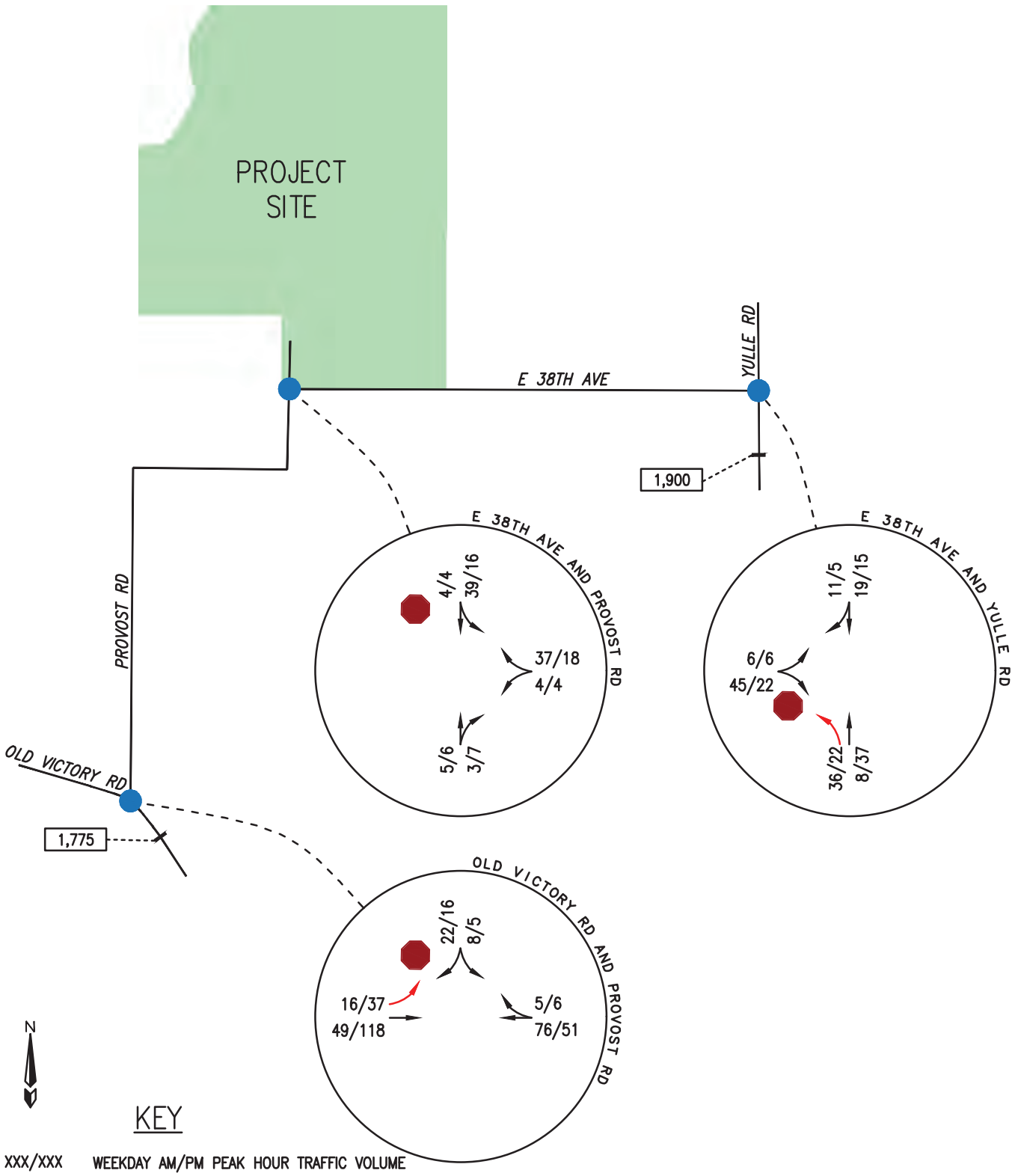


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BENNETT CREEK RANCH GRAVEL MINE TRAFFIC IMPACT STUDY

2026 BACKGROUND + PROJECT TRAFFIC VOLUMES

FT #	25081	Original Scale	NTS	Date	12/29/2025	Drawn by	CES	Figure #	7



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BENNETT CREEK RANCH GRAVEL MINE TRAFFIC IMPACT STUDY

2045 BACKGROUND + PROJECT TRAFFIC VOLUMES

FT #	25081	Original Scale	NTS	Date	12/29/2025	Drawn by	CES	Figure #	8

Appendix:

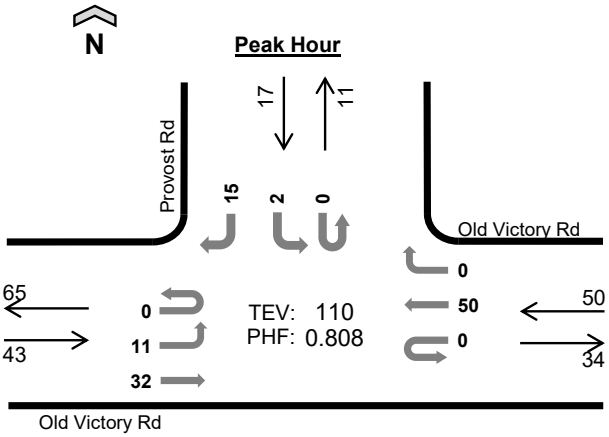
Existing Traffic Data

Level of Service Definitions

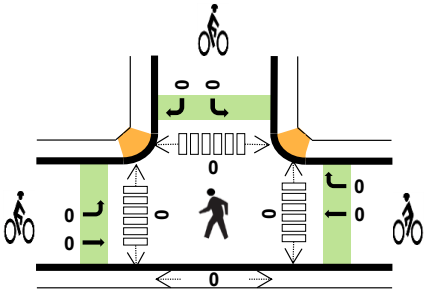
Intersection Capacity Worksheets

Existing Traffic Data

Provost Rd
Old Victory Rd



Date: 12/2/2025
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 7:00 AM to 8:00 AM



	HV%	PHF
EB	12%	0.60
WB	16%	0.78
NB	--	--
SB	12%	0.47
TOTAL	14%	0.81

Peak Hour Count Summaries

Peak Hour Interval Start		Old Victory Rd Eastbound				Old Victory Rd Westbound				n/a Northbound				Provost Rd Southbound				15-min Total	Rolling Hour Total
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM		0	1	4	0	0	0	10	0	0	0	0	0	0	1	0	4	20	0
7:15 AM		0	1	8	0	0	0	16	0	0	0	0	0	0	1	0	1	27	0
7:30 AM		0	3	8	0	0	0	14	0	0	0	0	0	0	0	0	9	34	0
7:45 AM		0	6	12	0	0	0	10	0	0	0	0	0	0	0	0	1	29	110
Pk Hr	All	0	11	32	0	0	0	50	0	0	0	0	0	0	2	0	15	110	
	HV	0	1	4	0	0	0	8	0	0	0	0	0	0	2	0	0	15	
	HV%	-	9%	13%	-	-	-	16%	-	-	-	-	-	-	100%	-	0%	14%	

Note: For complete count summary (all intervals), see following pages.
*** Heavy Vehicle Classifications include FHWA Classes 4-13.*
*** Count Summaries include heavy vehicles, but exclude bicycles in overall count.*

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
7:00 AM	1	1	0	1	*3*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	1	2	0	1	*4*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	1	2	0	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	2	3	0	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	5	8	0	2	*15*	0	0	0	0	*0*	0	0	0	0	*0*

TJ Wethington
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Count Summaries - All Vehicles

Interval Start	Old Victory Rd				Old Victory Rd				n/a				Provost Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	**0**	**1**	**4**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**4**	**20**	0
7:15 AM	**0**	**1**	**8**	**0**	**0**	**0**	**16**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**27**	**0**
7:30 AM	**0**	**3**	**8**	**0**	**0**	**0**	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**34**	**0**
7:45 AM	**0**	**6**	**12**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**29**	**110**
8:00 AM	0	0	10	0	0	0	6	1	0	0	0	0	0	0	0	1	18	108
8:15 AM	0	1	6	0	0	0	3	1	0	0	0	0	0	0	0	1	12	93
8:30 AM	0	0	6	0	0	0	4	0	0	0	0	0	0	2	0	3	15	74
8:45 AM	0	1	5	0	0	0	6	0	0	0	0	0	0	1	0	0	13	58
Count Total	0	13	59	0	0	0	69	2	0	0	0	0	0	5	0	20	168	
Pk Hr All	**0**	**11**	**32**	**0**	**0**	**0**	**50**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**15**	**110**	
Pk Hr HV	**0**	**1**	**4**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**15**	
Pk Hr HV%	**-**	**9%**	**13%**	**-**	**-**	**-**	**16%**	**-**	**-**	**-**	**-**	**-**	**-**	**100%**	**-**	**0%**	**14%**	

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
7:00 AM	**1**	**1**	**0**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
7:15 AM	**1**	**2**	**0**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
7:30 AM	**1**	**2**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
7:45 AM	**2**	**3**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:00 AM	3	2	0	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	1	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	2	2	0	1	*5*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	10	13	0	3	*26*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	**5**	**8**	**0**	**2**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	**0**

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Count Summaries - Heavy Vehicles

Interval Start	Old Victory Rd				Old Victory Rd				n/a				Provost Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**3**	0
7:15 AM	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**4**	**0**
7:30 AM	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**
7:45 AM	**0**	**0**	**2**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**15**
8:00 AM	0	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	5	17
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
8:30 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	11
8:45 AM	0	0	2	0	0	0	2	0	0	0	0	0	0	1	0	0	5	11
Count Total	0	1	9	0	0	0	13	0	0	0	0	0	0	3	0	0	26	
Pk Hr Heavy	**0**	**1**	**4**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**15**	

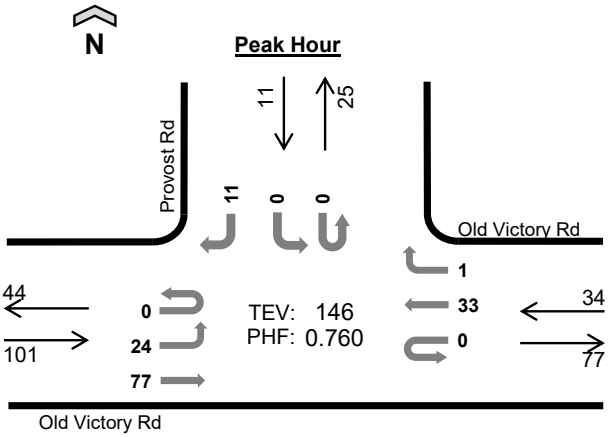
Count Summaries - Bikes

Interval Start	Old Victory Rd				Old Victory Rd				n/a				Provost Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
7:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
7:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
7:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pk Hr Bike	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

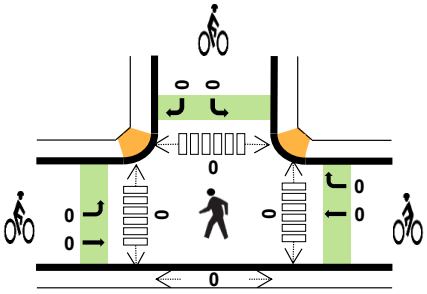
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Provost Rd
Old Victory Rd



Date: 12/2/2025
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:00 PM to 5:00 PM



	HV%	PHF
EB	9%	0.77
WB	12%	0.65
NB	--	--
SB	0%	0.55
TOTAL	9%	0.76

Peak Hour Count Summaries

Peak Hour Interval Start		Old Victory Rd Eastbound				Old Victory Rd Westbound				n/a Northbound				Provost Rd Southbound				15-min Total	Rolling Hour Total
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	12	21	0	0	0	8	0	0	0	0	0	0	0	0	0	41	0
4:15 PM		0	6	24	0	0	0	13	0	0	0	0	0	0	0	0	5	48	0
4:30 PM		0	2	18	0	0	0	4	1	0	0	0	0	0	0	0	3	28	0
4:45 PM		0	4	14	0	0	0	8	0	0	0	0	0	0	0	0	3	29	146
Pk Hr	All	0	24	77	0	0	0	33	1	0	0	0	0	0	0	0	11	146	
	HV	0	1	8	0	0	0	4	0	0	0	0	0	0	0	0	0	13	
	HV%	-	4%	10%	-	-	-	12%	0%	-	-	-	-	-	-	-	0%	9%	

Note: For complete count summary (all intervals), see following pages.
*** Heavy Vehicle Classifications include FHWA Classes 4-13.*
*** Count Summaries include heavy vehicles, but exclude bicycles in overall count.*

Interval Start	Heavy Vehicle Totals EB	WB	NB	SB	Total	Bicycles EB	WB	NB	SB	Total	Pedestrians (Crossing Leg) E	W	N	S	Total
4:00 PM	1	0	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	2	3	0	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	4	0	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	2	1	0	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	9	4	0	0	*13*	0	0	0	0	*0*	0	0	0	0	*0*

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Count Summaries - All Vehicles

Interval Start	Old Victory Rd				Old Victory Rd				n/a				Provost Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	**0**	**12**	**21**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**41**	0
4:15 PM	**0**	**6**	**24**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**48**	**0**
4:30 PM	**0**	**2**	**18**	**0**	**0**	**0**	**4**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**28**	**0**
4:45 PM	**0**	**4**	**14**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**29**	**146**
5:00 PM	0	6	21	0	0	0	8	1	0	0	0	0	0	0	0	4	40	145
5:15 PM	0	5	6	0	0	0	7	0	0	0	0	0	0	0	0	1	19	116
5:30 PM	0	5	11	0	0	0	7	0	0	0	0	0	0	0	0	2	25	113
5:45 PM	0	4	7	0	0	0	9	0	0	0	0	0	0	0	0	1	21	105
Count Total	0	44	122	0	0	0	64	2	0	0	0	0	0	0	0	19	251	
Pk Hr All	**0**	**24**	**77**	**0**	**0**	**0**	**33**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**146**	
Pk Hr HV	**0**	**1**	**8**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	
Pk Hr HV%	**-**	**4%**	**10%**	**-**	**-**	**-**	**12%**	**0%**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0%**	**9%**	

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
4:00 PM	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:15 PM	**2**	**3**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:30 PM	**4**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	**2**	**1**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:00 PM	2	1	0	1	*4*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	1	0	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	12	5	0	1	*18*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	**9**	**4**	**0**	**0**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	**0**

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Count Summaries - Heavy Vehicles

Interval Start	Old Victory Rd				Old Victory Rd				n/a				Provost Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	0
4:15 PM	**0**	**1**	**1**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**
4:30 PM	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**
4:45 PM	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**13**
5:00 PM	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	1	4	16
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
5:30 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Count Total	0	2	10	0	0	0	5	0	0	0	0	0	0	0	0	1	18	
Pk Hr Heavy	**0**	**1**	**8**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	

Count Summaries - Bikes

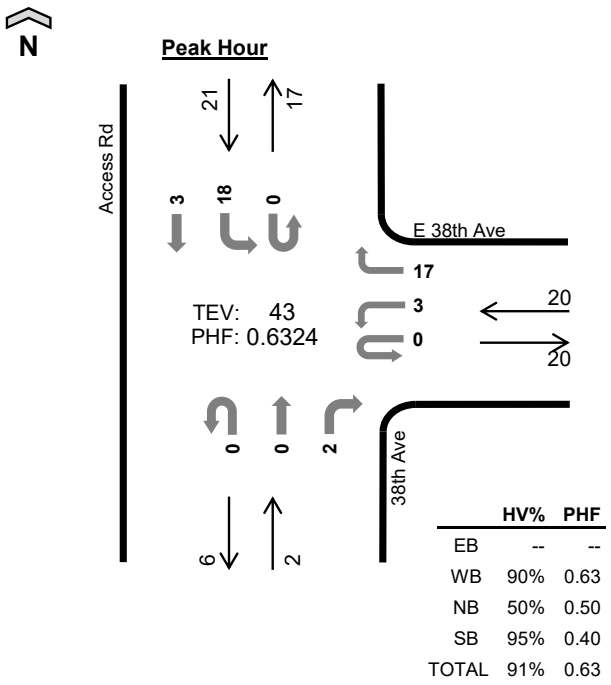
Interval Start	Old Victory Rd				Old Victory Rd				n/a				Provost Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pk Hr Bike	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

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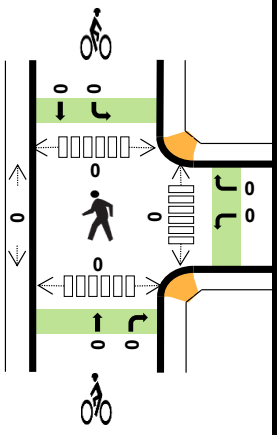
tj.wethington@idaxdata.com

Access Rd
E 38th Ave

Date: 12/2/2025
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 8:00 AM to 9:00 AM



	HV%	PHF
EB	--	--
WB	90%	0.63
NB	50%	0.50
SB	95%	0.40
TOTAL	91%	0.63



Peak Hour Count Summaries

Peak Hour Interval Start		n/a				E 38th Ave				38th Ave				Access Rd				15-min Total	Rolling Hour Total
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
8:00 AM		0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	8	0
8:15 AM		0	0	0	0	0	0	0	4	0	0	0	0	0	0	1	0	5	0
8:30 AM		0	0	0	0	0	1	0	4	0	0	0	1	0	7	0	0	13	0
8:45 AM		0	0	0	0	0	2	0	1	0	0	0	1	0	11	2	0	17	43
Pk Hr	All	0	0	0	0	0	3	0	17	0	0	0	2	0	18	3	0	43	
	HV	0	0	0	0	0	1	0	17	0	0	0	1	0	18	2	0	39	
	HV%	-	-	-	-	-	33%	-	100%	-	-	-	50%	-	100%	67%	-	91%	

Note: For complete count summary (all intervals), see following pages.
*** Heavy Vehicle Classifications include FHWA Classes 4-13.*
*** Count Summaries include heavy vehicles, but exclude bicycles in overall count.*

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
8:00 AM	0	8	0	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	0	4	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	0	4	0	7	*11*	0	0	0	0	*0*	0	0	0	0	*0*
8:45 AM	0	2	1	13	*16*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	18	1	20	*39*	0	0	0	0	*0*	0	0	0	0	*0*

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Count Summaries - All Vehicles

Interval Start	n/a				E 38th Ave				38th Ave				Access Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0
7:15 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
7:30 AM	0	0	0	0	0	0	0	4	0	0	0	1	0	0	0	0	5	0
7:45 AM	0	0	0	0	0	0	0	10	0	0	2	0	0	1	0	0	13	21
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**27**
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**5**	**31**
8:30 AM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**1**	**0**	**7**	**0**	**0**	**13**	**39**
8:45 AM	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**11**	**2**	**0**	**17**	**43**
Count Total	0	0	0	0	0	6	0	31	0	0	2	3	0	19	3	0	64	
Pk Hr All	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**17**	**0**	**0**	**0**	**2**	**0**	**18**	**3**	**0**	**43**	
Pk Hr HV	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**17**	**0**	**0**	**0**	**1**	**0**	**18**	**2**	**0**	**39**	
Pk Hr HV%	**-**	**-**	**-**	**-**	**-**	**33%**	**-**	**100%**	**-**	**-**	**-**	**50%**	**-**	**100%**	**67%**	**-**	**91%**	

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
7:00 AM	0	1	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	0	2	0	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	0	10	0	0	*10*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	**0**	**8**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:15 AM	**0**	**4**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:30 AM	**0**	**4**	**0**	**7**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	**0**	**2**	**1**	**13**	**16**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	0	31	1	20	*52*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	**0**	**18**	**1**	**20**	***39***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	**0**

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Count Summaries - Heavy Vehicles

Interval Start	n/a				E 38th Ave				38th Ave				Access Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0
7:45 AM	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	10	13
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**20**
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**24**
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**11**	**33**
8:45 AM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**11**	**2**	**0**	**16**	**39**
Count Total	0	0	0	0	0	2	0	29	0	0	0	1	0	18	2	0	52	
Pk Hr Heavy	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**17**	**0**	**0**	**0**	**1**	**0**	**18**	**2**	**0**	**39**	

Count Summaries - Bikes

Interval Start	n/a				E 38th Ave				38th Ave				Access Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pk Hr Bike	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

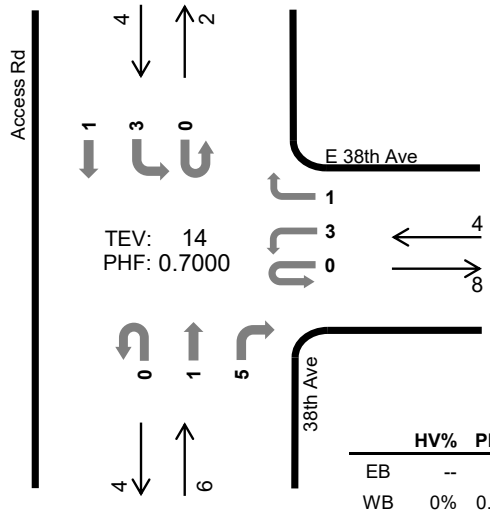
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Access Rd
E 38th Ave

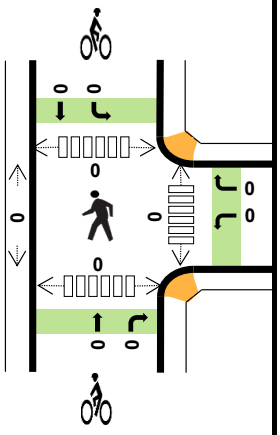
Date: 12/2/2025
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:00 PM to 5:00 PM

N

Peak Hour



	HV%	PHF
EB	--	--
WB	0%	0.50
NB	0%	0.50
SB	50%	0.50
TOTAL	14%	0.70



Peak Hour Count Summaries

Peak Hour Interval Start	n/a				E 38th Ave				38th Ave				Access Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	3	0	2	0	0	5	0
4:15 PM	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	4	0
4:30 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	3	0
4:45 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2	14
Pk Hr All	0	0	0	0	0	3	0	1	0	0	1	5	0	3	1	0	14	
Pk Hr HV	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	
Pk Hr HV%	-	-	-	-	-	0%	-	0%	-	-	0%	0%	-	67%	0%	-	14%	

Note: For complete count summary (all intervals), see following pages.
*** Heavy Vehicle Classifications include FHWA Classes 4-13.*
*** Count Summaries include heavy vehicles, but exclude bicycles in overall count.*

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
4:00 PM	0	0	0	2	*2*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	0	0	0	2	*2*	0	0	0	0	*0*	0	0	0	0	*0*

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Count Summaries - All Vehicles

Interval Start	n/a				E 38th Ave				38th Ave				Access Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**2**	**0**	**0**	**5**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**4**	**0**
4:30 PM	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**3**	**0**
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**14**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	7
5:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	5
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Count Total	0	0	0	0	0	4	0	1	0	0	1	6	0	4	1	0	17	
Pk Hr All	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**1**	**5**	**0**	**3**	**1**	**0**	**14**	
Pk Hr HV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**2**	
Pk Hr HV%	**-**	**-**	**-**	**-**	**-**	**0%**	**-**	**0%**	**-**	**-**	**0%**	**0%**	**-**	**67%**	**0%**	**-**	**14%**	

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
4:00 PM	**0**	**0**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:00 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	0	1	*1*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	0	0	0	3	*3*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	**0**	**0**	**0**	**2**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	**0**

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Count Summaries - Heavy Vehicles

Interval Start	n/a				E 38th Ave				38th Ave				Access Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**2**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	
Pk Hr Heavy	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**2**	

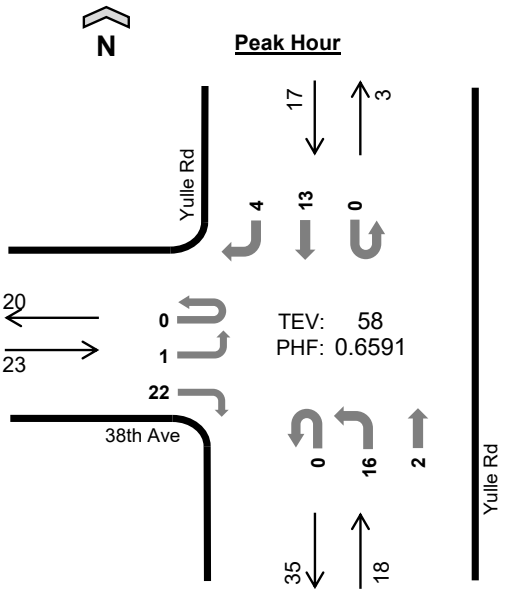
Count Summaries - Bikes

Interval Start	n/a				E 38th Ave				38th Ave				Access Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pk Hr Bike	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

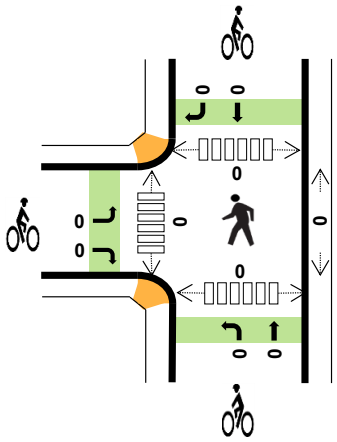
TJ Wethington
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Yulle Rd
38th Ave

Date: 12/2/2025
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 8:00 AM to 9:00 AM



	HV%	PHF
EB	78%	0.48
WB	--	--
NB	83%	0.50
SB	18%	0.39
TOTAL	62%	0.66



Peak Hour Count Summaries

Peak Hour Interval Start		38th Ave Eastbound				n/a Westbound				Yulle Rd Northbound				Yulle Rd Southbound				15-min Total	Rolling Hour Total
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
8:00 AM		**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**7**	**2**	**0**	**0**	**0**	**9**	**2**	**22**	**0**
8:15 AM		**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**1**	**1**	**9**	**0**
8:30 AM		**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**2**	**1**	**12**	**0**
8:45 AM		**0**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**0**	**15**	**58**
Pk Hr	All	**0**	**1**	**0**	**22**	**0**	**0**	**0**	**0**	**0**	**16**	**2**	**0**	**0**	**0**	**13**	**4**	**58**	
	HV	**0**	**0**	**0**	**18**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**3**	**36**	
	HV%	-	**0%**	-	**82%**	-	-	-	-	-	**94%**	**0%**	-	-	-	**0%**	**75%**	**62%**	

Note: For complete count summary (all intervals), see following pages.
*** Heavy Vehicle Classifications include FHWA Classes 4-13.*
*** Count Summaries include heavy vehicles, but exclude bicycles in overall count.*

Interval Start	Heavy Vehicle Totals EB	WB	NB	SB	Total	Bicycles EB	WB	NB	SB	Total	Pedestrians (Crossing Leg) E	W	N	S	Total
8:00 AM	**0**	**0**	**7**	**2**	***9***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:15 AM	**0**	**0**	**5**	**0**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:30 AM	**6**	**0**	**2**	**1**	***9***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
8:45 AM	**12**	**0**	**1**	**0**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Peak Hour	**18**	**0**	**15**	**3**	***36***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

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Count Summaries - All Vehicles

Interval Start	38th Ave				n/a				Yulle Rd				Yulle Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	2	0	0	0	0	0	0	0	0	0	0	6	1	9	0
7:15 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	5	0	6	0
7:30 AM	0	0	0	1	0	0	0	0	0	6	2	0	0	0	4	0	13	0
7:45 AM	0	0	0	1	0	0	0	0	0	9	0	0	0	0	3	0	13	41
8:00 AM	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**7**	**2**	**0**	**0**	**0**	**9**	**2**	**22**	**54**
8:15 AM	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**1**	**1**	**9**	**57**
8:30 AM	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**2**	**1**	**12**	**56**
8:45 AM	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**0**	**15**	**58**
Count Total	0	1	0	27	0	0	0	0	0	31	4	0	0	0	31	5	99	
Pk Hr All	**0**	**1**	**0**	**22**	**0**	**0**	**0**	**0**	**0**	**16**	**2**	**0**	**0**	**0**	**13**	**4**	**58**	
Pk Hr HV	**0**	**0**	**0**	**18**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**3**	**36**	
Pk Hr HV%	**-**	**0%**	**-**	**82%**	**-**	**-**	**-**	**-**	**-**	**94%**	**0%**	**-**	**-**	**-**	**0%**	**75%**	**62%**	

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
7:00 AM	0	0	0	1	*1*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	0	0	3	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	0	0	9	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	**0**	**0**	**7**	**2**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:15 AM	**0**	**0**	**5**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:30 AM	**6**	**0**	**2**	**1**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	**12**	**0**	**1**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	18	0	27	4	*49*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	**18**	**0**	**15**	**3**	***36***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	**0**

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Count Summaries - Heavy Vehicles

Interval Start	38th Ave				n/a				Yulle Rd				Yulle Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	0
7:45 AM	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	9	13
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**2**	**9**	**21**
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**26**
8:30 AM	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**9**	**32**
8:45 AM	**0**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**36**
Count Total	0	0	0	18	0	0	0	0	0	27	0	0	0	0	0	4	49	
Pk Hr Heavy	**0**	**0**	**0**	**18**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**0**	**0**	**0**	**0**	**3**	**36**	

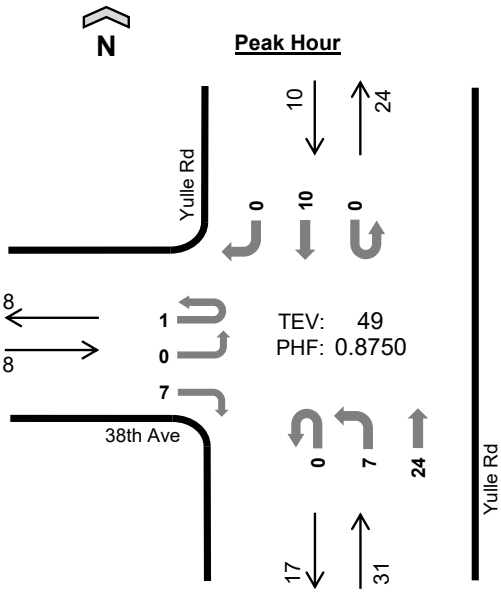
Count Summaries - Bikes

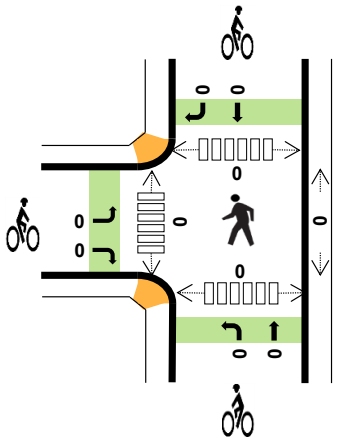
Interval Start	38th Ave				n/a				Yulle Rd				Yulle Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pk Hr Bike	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

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Yulle Rd
38th Ave

Date: 12/2/2025
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:00 PM to 5:00 PM





	HV%	PHF
EB	38%	0.67
WB	--	--
NB	3%	0.78
SB	10%	0.83
TOTAL	10%	0.88

Peak Hour Count Summaries

Peak Hour Interval Start		38th Ave				n/a				Yulle Rd				Yulle Rd				15-min Total	Rolling Hour Total
		Eastbound				Westbound				Northbound				Southbound					
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**2**	**8**	**0**	**0**	**0**	**1**	**0**	**14**	**0**
4:15 PM		**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**6**	**0**	**0**	**0**	**3**	**0**	**13**	**0**
4:30 PM		**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**5**	**0**	**0**	**0**	**3**	**0**	**12**	**0**
4:45 PM		**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**5**	**0**	**0**	**0**	**3**	**0**	**10**	**49**
Pk Hr	All	**1**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**7**	**24**	**0**	**0**	**0**	**10**	**0**	**49**	
	HV	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**5**	
	HV%	**0%**	-	-	**43%**	-	-	-	-	-	**0%**	**4%**	-	-	-	**10%**	-	**10%**	

Note: For complete count summary (all intervals), see following pages.
*** Heavy Vehicle Classifications include FHWA Classes 4-13.*
*** Count Summaries include heavy vehicles, but exclude bicycles in overall count.*

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
4:00 PM	**2**	**0**	**1**	**1**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:15 PM	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:30 PM	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:45 PM	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Peak Hour	**3**	**0**	**1**	**1**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

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Count Summaries - All Vehicles

Interval Start	38th Ave				n/a				Yulle Rd				Yulle Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**2**	**8**	**0**	**0**	**0**	**1**	**0**	**14**	0
4:15 PM	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**6**	**0**	**0**	**0**	**3**	**0**	**13**	**0**
4:30 PM	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**5**	**0**	**0**	**0**	**3**	**0**	**12**	**0**
4:45 PM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**5**	**0**	**0**	**0**	**3**	**0**	**10**	**49**
5:00 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	1	0	6	41
5:15 PM	1	0	0	1	0	0	0	0	0	1	7	0	0	0	3	0	13	41
5:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	5	34
5:45 PM	0	0	0	1	0	0	0	0	0	1	2	0	0	0	1	0	5	29
Count Total	2	0	0	9	0	0	0	0	0	9	40	0	0	0	18	0	78	
Pk Hr All	**1**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**7**	**24**	**0**	**0**	**0**	**10**	**0**	**49**	
Pk Hr HV	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**5**	
Pk Hr HV%	**0%**	**-**	**-**	**43%**	**-**	**-**	**-**	**-**	**-**	**0%**	**4%**	**-**	**-**	**-**	**10%**	**-**	**10%**	

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	E	W	N	S	Total
4:00 PM	**2**	**0**	**1**	**1**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:15 PM	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:00 PM	0	0	1	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	1	0	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	4	0	2	1	*7*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hour	**3**	**0**	**1**	**1**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	**0**

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Count Summaries - Heavy Vehicles

Interval Start	38th Ave				n/a				Yulle Rd				Yulle Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**4**	0
4:15 PM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**
5:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2
5:15 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Count Total	0	0	0	4	0	0	0	0	0	0	2	0	0	0	1	0	7	
Pk Hr Heavy	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**5**	

Count Summaries - Bikes

Interval Start	38th Ave				n/a				Yulle Rd				Yulle Rd				15-min Total	Rolling Hour Total
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
4:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pk Hr Bike	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

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Vehicle Classification Report Summary

Location: Victory Rd E/O Provost Rd

Count Direction: Eastbound / Westbound

Date Range: 12/2/2025 to 12/2/2025

Site Code: 01

Direction	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Eastbound	1	289	210	12	131	13	0	2	20	1	0	0	1	680
	0.1%	42.5%	30.9%	1.8%	19.3%	1.9%	0.0%	0.3%	2.9%	0.1%	0.0%	0.0%	0.1%	
Westbound	1	210	159	8	75	13	0	0	10	2	0	0	1	479
	0.2%	43.8%	33.2%	1.7%	15.7%	2.7%	0.0%	0.0%	2.1%	0.4%	0.0%	0.0%	0.2%	
Total	2	499	369	20	206	26	0	2	30	3	0	0	2	1,159
	0.2%	43.1%	31.8%	1.7%	17.8%	2.2%	0.0%	0.2%	2.6%	0.3%	0.0%	0.0%	0.2%	

FHWA Vehicle Classification	
Class 1 - Motorcycles	Class 8 - Four or Fewer Axle Single-Trailer Trucks
Class 2 - Passenger Cars	Class 9 - Five-Axle Single-Trailer Trucks
Class 3 - Other Two-Axle, Four-Tire Single Unit Vehicles	Class 10 - Six or More Axle Single-Trailer Trucks
Class 4 - Buses	Class 11 - Five or fewer Axle Multi-Trailer Trucks
Class 5 - Two-Axle, Six-Tire, Single-Unit Trucks	Class 12 - Six-Axle Multi-Trailer Trucks
Class 6 - Three-Axle Single-Unit Trucks	Class 13 - Seven or More Axle Multi-Trailer Trucks
Class 7 - Four or More Axle Single-Unit Trucks	

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Location: Victory Rd E/O Provost Rd
Date Range: 12/2/2025 to 12/2/2025
Site Code: 01

Tuesday, December 2, 2025
Eastbound

Time	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1:00 AM	0	1	1	0	1	0	0	0	0	0	0	0	0	**3**
2:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
3:00 AM	0	1	0	0	0	0	0	0	1	0	0	0	0	**2**
4:00 AM	0	3	0	0	1	0	0	0	0	0	0	0	0	**4**
5:00 AM	0	3	5	0	4	0	0	0	1	0	0	0	0	**13**
6:00 AM	0	12	11	0	11	1	0	0	0	1	0	0	0	**36**
7:00 AM	0	19	12	2	9	0	0	1	1	0	0	0	0	**44**
8:00 AM	0	15	5	1	8	1	0	0	0	0	0	0	0	**30**
9:00 AM	0	8	14	1	5	1	0	0	0	0	0	0	0	**29**
10:00 AM	0	14	10	0	7	2	0	0	3	0	0	0	0	**36**
11:00 AM	0	11	12	0	5	0	0	0	1	0	0	0	0	**29**
12:00 PM	0	25	7	2	9	2	0	0	2	0	0	0	0	**47**
1:00 PM	0	11	16	1	5	2	0	0	6	0	0	0	0	**41**
2:00 PM	1	18	12	1	4	1	0	0	1	0	0	0	0	**38**
3:00 PM	0	19	21	1	11	1	0	0	2	0	0	0	0	**55**
4:00 PM	0	42	30	3	20	2	0	1	1	0	0	0	1	**100**
5:00 PM	0	33	18	0	13	0	0	0	1	0	0	0	0	**65**
6:00 PM	0	19	19	0	10	0	0	0	0	0	0	0	0	**48**
7:00 PM	0	12	6	0	4	0	0	0	0	0	0	0	0	**22**
8:00 PM	0	15	8	0	4	0	0	0	0	0	0	0	0	**27**
9:00 PM	0	4	2	0	0	0	0	0	0	0	0	0	0	**6**
10:00 PM	0	2	1	0	0	0	0	0	0	0	0	0	0	**3**
11:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
Total	**1**	**289**	**210**	**12**	**131**	**13**	**0**	**2**	**20**	**1**	**0**	**0**	**1**	**680**
	0.1%	**42.5%**	**30.9%**	**1.8%**	**19.3%**	**1.9%**	**0.0%**	**0.3%**	**2.9%**	**0.1%**	**0.0%**	**0.0%**	**0.1%**	

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Victory Rd E/O Provost Rd
Date Range: 12/2/2025 to 12/2/2025
Site Code: 01

Tuesday, December 2, 2025
Westbound

Time	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1:00 AM	0	1	1	0	0	0	0	0	0	0	0	0	0	**2**
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
3:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	**2**
4:00 AM	0	1	0	0	2	0	0	0	0	0	0	0	0	**3**
5:00 AM	0	4	2	0	5	0	0	0	0	0	0	0	0	**11**
6:00 AM	0	13	9	0	5	0	0	0	0	0	0	0	0	**27**
7:00 AM	0	32	24	3	3	2	0	0	0	1	0	0	1	**66**
8:00 AM	0	6	11	1	4	1	0	0	0	0	0	0	0	**23**
9:00 AM	0	17	3	1	2	1	0	0	1	0	0	0	0	**25**
10:00 AM	0	6	8	0	6	1	0	0	0	0	0	0	0	**21**
11:00 AM	0	17	6	1	0	2	0	0	3	0	0	0	0	**29**
12:00 PM	0	12	11	0	2	1	0	0	0	0	0	0	0	**26**
1:00 PM	0	12	7	1	5	2	0	0	0	0	0	0	0	**27**
2:00 PM	1	16	13	0	7	1	0	0	1	0	0	0	0	**39**
3:00 PM	0	14	12	0	4	2	0	0	1	0	0	0	0	**33**
4:00 PM	0	20	13	1	9	0	0	0	1	0	0	0	0	**44**
5:00 PM	0	15	16	0	6	0	0	0	0	0	0	0	0	**37**
6:00 PM	0	6	9	0	5	0	0	0	1	0	0	0	0	**21**
7:00 PM	0	5	6	0	5	0	0	0	2	0	0	0	0	**18**
8:00 PM	0	8	4	0	0	0	0	0	0	0	0	0	0	**12**
9:00 PM	0	4	1	0	3	0	0	0	0	0	0	0	0	**8**
10:00 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	**2**
11:00 PM	0	0	2	0	1	0	0	0	0	0	0	0	0	**3**
Total	**1**	**210**	**159**	**8**	**75**	**13**	**0**	**0**	**10**	**2**	**0**	**0**	**1**	**479**
	0.2%	**43.8%**	**33.2%**	**1.7%**	**15.7%**	**2.7%**	**0.0%**	**0.0%**	**2.1%**	**0.4%**	**0.0%**	**0.0%**	**0.2%**	

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Victory Rd E/O Provost Rd
Date Range: 12/2/2025 to 12/2/2025
Site Code: 01

Total Study Average
Eastbound

Time	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1:00 AM	0	1	1	0	1	0	0	0	0	0	0	0	0	**3**
2:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
3:00 AM	0	1	0	0	0	0	0	0	1	0	0	0	0	**2**
4:00 AM	0	3	0	0	1	0	0	0	0	0	0	0	0	**4**
5:00 AM	0	3	5	0	4	0	0	0	1	0	0	0	0	**13**
6:00 AM	0	12	11	0	11	1	0	0	0	1	0	0	0	**36**
7:00 AM	0	19	12	2	9	0	0	1	1	0	0	0	0	**44**
8:00 AM	0	15	5	1	8	1	0	0	0	0	0	0	0	**30**
9:00 AM	0	8	14	1	5	1	0	0	0	0	0	0	0	**29**
10:00 AM	0	14	10	0	7	2	0	0	3	0	0	0	0	**36**
11:00 AM	0	11	12	0	5	0	0	0	1	0	0	0	0	**29**
12:00 PM	0	25	7	2	9	2	0	0	2	0	0	0	0	**47**
1:00 PM	0	11	16	1	5	2	0	0	6	0	0	0	0	**41**
2:00 PM	1	18	12	1	4	1	0	0	1	0	0	0	0	**38**
3:00 PM	0	19	21	1	11	1	0	0	2	0	0	0	0	**55**
4:00 PM	0	42	30	3	20	2	0	1	1	0	0	0	1	**100**
5:00 PM	0	33	18	0	13	0	0	0	1	0	0	0	0	**65**
6:00 PM	0	19	19	0	10	0	0	0	0	0	0	0	0	**48**
7:00 PM	0	12	6	0	4	0	0	0	0	0	0	0	0	**22**
8:00 PM	0	15	8	0	4	0	0	0	0	0	0	0	0	**27**
9:00 PM	0	4	2	0	0	0	0	0	0	0	0	0	0	**6**
10:00 PM	0	2	1	0	0	0	0	0	0	0	0	0	0	**3**
11:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
Total	**1**	**289**	**210**	**12**	**131**	**13**	**0**	**2**	**20**	**1**	**0**	**0**	**1**	**680**
	0.1%	**42.5%**	**30.9%**	**1.8%**	**19.3%**	**1.9%**	**0.0%**	**0.3%**	**2.9%**	**0.1%**	**0.0%**	**0.0%**	**0.1%**	

Note: Average only condsidered on days with 24-hours of data.

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Victory Rd E/O Provost Rd
Date Range: 12/2/2025 to 12/2/2025
Site Code: 01

Total Study Average
Westbound

Time	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1:00 AM	0	1	1	0	0	0	0	0	0	0	0	0	0	**2**
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
3:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	**2**
4:00 AM	0	1	0	0	2	0	0	0	0	0	0	0	0	**3**
5:00 AM	0	4	2	0	5	0	0	0	0	0	0	0	0	**11**
6:00 AM	0	13	9	0	5	0	0	0	0	0	0	0	0	**27**
7:00 AM	0	32	24	3	3	2	0	0	0	1	0	0	1	**66**
8:00 AM	0	6	11	1	4	1	0	0	0	0	0	0	0	**23**
9:00 AM	0	17	3	1	2	1	0	0	1	0	0	0	0	**25**
10:00 AM	0	6	8	0	6	1	0	0	0	0	0	0	0	**21**
11:00 AM	0	17	6	1	0	2	0	0	3	0	0	0	0	**29**
12:00 PM	0	12	11	0	2	1	0	0	0	0	0	0	0	**26**
1:00 PM	0	12	7	1	5	2	0	0	0	0	0	0	0	**27**
2:00 PM	1	16	13	0	7	1	0	0	1	0	0	0	0	**39**
3:00 PM	0	14	12	0	4	2	0	0	1	0	0	0	0	**33**
4:00 PM	0	20	13	1	9	0	0	0	1	0	0	0	0	**44**
5:00 PM	0	15	16	0	6	0	0	0	0	0	0	0	0	**37**
6:00 PM	0	6	9	0	5	0	0	0	1	0	0	0	0	**21**
7:00 PM	0	5	6	0	5	0	0	0	2	0	0	0	0	**18**
8:00 PM	0	8	4	0	0	0	0	0	0	0	0	0	0	**12**
9:00 PM	0	4	1	0	3	0	0	0	0	0	0	0	0	**8**
10:00 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	**2**
11:00 PM	0	0	2	0	1	0	0	0	0	0	0	0	0	**3**
Total	**1**	**210**	**159**	**8**	**75**	**13**	**0**	**0**	**10**	**2**	**0**	**0**	**1**	**479**
	0.2%	**43.8%**	**33.2%**	**1.7%**	**15.7%**	**2.7%**	**0.0%**	**0.0%**	**2.1%**	**0.4%**	**0.0%**	**0.0%**	**0.2%**	

Note: Average only condsidered on days with 24-hours of data.

TJ Wethington: 720-646-1008
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Vehicle Speed Report Summary

Location: Victory Rd E/O Provost Rd

Direction: Eastbound / Westbound

Date Range: 12/2/2025 to 12/2/2025

Site Code: 01

Direction	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
Eastbound	0	0	4	14	55	123	152	136	111	57	23	5	0	0	0	0	0	**680**
	0.0%	0.0%	0.6%	2.1%	8.1%	18.1%	22.4%	20.0%	16.3%	8.4%	3.4%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	
Westbound	0	1	2	26	69	85	110	126	48	9	2	1	0	0	0	0	0	**479**
	0.0%	0.2%	0.4%	5.4%	14.4%	17.7%	23.0%	26.3%	10.0%	1.9%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	
Total	0	1	6	40	124	208	262	262	159	66	25	6	0	0	0	0	0	**1,159**
	0.0%	0.1%	0.5%	3.5%	10.7%	17.9%	22.6%	22.6%	13.7%	5.7%	2.2%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	

Total Study Percentile Speed Summary			Total Study Speed Statistics		
Eastbound			**Eastbound**		
50th Percentile (Median)	39.7	mph	Mean (Average) Speed	40.1	mph
85th Percentile	48.9	mph	10 mph Pace	33.8 - 43.8	mph
95th Percentile	54.2	mph	Percent in Pace	42.7	%
Westbound			**Westbound**		
50th Percentile (Median)	37.9	mph	Mean (Average) Speed	37.0	mph
85th Percentile	44.5	mph	10 mph Pace	35.2 - 45.2	mph
95th Percentile	48.2	mph	Percent in Pace	49.5	%

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Victory Rd E/O Provost Rd
Date Range: 12/2/2025 to 12/2/2025
Site Code: 01

Tuesday, December 2, 2025
Eastbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1:00 AM	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	**3**
2:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
3:00 AM	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	**2**
4:00 AM	0	0	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	**4**
5:00 AM	0	0	0	2	2	1	1	0	3	3	1	0	0	0	0	0	0	**13**
6:00 AM	0	0	0	2	2	1	4	7	9	7	3	1	0	0	0	0	0	**36**
7:00 AM	0	0	0	0	3	8	13	12	7	1	0	0	0	0	0	0	0	**44**
8:00 AM	0	0	0	0	2	4	8	7	1	5	2	1	0	0	0	0	0	**30**
9:00 AM	0	0	0	0	1	4	8	3	4	6	2	1	0	0	0	0	0	**29**
10:00 AM	0	0	0	1	6	4	12	4	6	1	2	0	0	0	0	0	0	**36**
11:00 AM	0	0	0	0	2	6	7	5	8	0	1	0	0	0	0	0	0	**29**
12:00 PM	0	0	1	0	4	14	8	7	7	4	2	0	0	0	0	0	0	**47**
1:00 PM	0	0	1	1	2	10	8	8	6	4	1	0	0	0	0	0	0	**41**
2:00 PM	0	0	0	0	3	4	13	9	5	1	3	0	0	0	0	0	0	**38**
3:00 PM	0	0	0	4	8	15	5	6	15	1	0	1	0	0	0	0	0	**55**
4:00 PM	0	0	0	1	7	20	29	30	9	4	0	0	0	0	0	0	0	**100**
5:00 PM	0	0	1	0	7	13	17	13	9	3	1	1	0	0	0	0	0	**65**
6:00 PM	0	0	0	0	3	7	7	14	10	6	1	0	0	0	0	0	0	**48**
7:00 PM	0	0	0	1	2	3	6	3	5	2	0	0	0	0	0	0	0	**22**
8:00 PM	0	0	0	0	0	5	3	3	6	7	3	0	0	0	0	0	0	**27**
9:00 PM	0	0	0	0	0	2	0	3	0	1	0	0	0	0	0	0	0	**6**
10:00 PM	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	**3**
11:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
Total	**0**	**0**	**4**	**14**	**55**	**123**	**152**	**136**	**111**	**57**	**23**	**5**	**0**	**0**	**0**	**0**	**0**	**680**
	0.0%	**0.0%**	**0.6%**	**2.1%**	**8.1%**	**18.1%**	**22.4%**	**20.0%**	**16.3%**	**8.4%**	**3.4%**	**0.7%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	39.7	mph	Mean (Average) Speed	40.1	mph
85th Percentile	48.9	mph	10 mph Pace	33.8 - 43.8	mph
95th Percentile	54.2	mph	Percent in Pace	42.7	%

TJ Wethington: 720-646-1008
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Location: Victory Rd E/O Provost Rd
Date Range: 12/2/2025 to 12/2/2025
Site Code: 01

Tuesday, December 2, 2025
Westbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1:00 AM	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	**2**
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
3:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	**2**
4:00 AM	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	**3**
5:00 AM	0	0	0	0	1	1	2	5	2	0	0	0	0	0	0	0	0	**11**
6:00 AM	0	0	0	3	4	2	6	8	3	0	0	1	0	0	0	0	0	**27**
7:00 AM	0	0	0	4	8	9	23	16	6	0	0	0	0	0	0	0	0	**66**
8:00 AM	0	0	0	2	3	2	4	7	4	1	0	0	0	0	0	0	0	**23**
9:00 AM	0	0	0	1	2	10	4	5	2	0	1	0	0	0	0	0	0	**25**
10:00 AM	0	0	0	0	6	3	7	4	1	0	0	0	0	0	0	0	0	**21**
11:00 AM	0	0	1	1	3	8	6	9	1	0	0	0	0	0	0	0	0	**29**
12:00 PM	0	0	0	1	5	2	4	10	3	1	0	0	0	0	0	0	0	**26**
1:00 PM	0	1	0	2	7	7	5	3	2	0	0	0	0	0	0	0	0	**27**
2:00 PM	0	0	1	2	7	9	9	9	2	0	0	0	0	0	0	0	0	**39**
3:00 PM	0	0	0	2	5	8	7	7	4	0	0	0	0	0	0	0	0	**33**
4:00 PM	0	0	0	4	4	7	10	16	3	0	0	0	0	0	0	0	0	**44**
5:00 PM	0	0	0	1	4	3	8	13	5	2	1	0	0	0	0	0	0	**37**
6:00 PM	0	0	0	0	4	2	10	0	3	2	0	0	0	0	0	0	0	**21**
7:00 PM	0	0	0	1	3	6	1	5	2	0	0	0	0	0	0	0	0	**18**
8:00 PM	0	0	0	1	0	2	4	3	1	1	0	0	0	0	0	0	0	**12**
9:00 PM	0	0	0	0	2	0	0	3	3	0	0	0	0	0	0	0	0	**8**
10:00 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	**2**
11:00 PM	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	**3**
Total	**0**	**1**	**2**	**26**	**69**	**85**	**110**	**126**	**48**	**9**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**479**
	0.0%	**0.2%**	**0.4%**	**5.4%**	**14.4%**	**17.7%**	**23.0%**	**26.3%**	**10.0%**	**1.9%**	**0.4%**	**0.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	37.9	mph	Mean (Average) Speed	37	mph
85th Percentile	44.5	mph	10 mph Pace	35.2 - 45.2	mph
95th Percentile	48.2	mph	Percent in Pace	49.48	%

TJ Wethington: 720-646-1008
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Location: Victory Rd E/O Provost Rd
Date Range: 12/2/2025 to 12/2/2025
Site Code: 01

Total Study Average
Eastbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1:00 AM	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	**3**
2:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
3:00 AM	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	**2**
4:00 AM	0	0	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	**4**
5:00 AM	0	0	0	2	2	1	1	0	3	3	1	0	0	0	0	0	0	**13**
6:00 AM	0	0	0	2	2	1	4	7	9	7	3	1	0	0	0	0	0	**36**
7:00 AM	0	0	0	0	3	8	13	12	7	1	0	0	0	0	0	0	0	**44**
8:00 AM	0	0	0	0	2	4	8	7	1	5	2	1	0	0	0	0	0	**30**
9:00 AM	0	0	0	0	1	4	8	3	4	6	2	1	0	0	0	0	0	**29**
10:00 AM	0	0	0	1	6	4	12	4	6	1	2	0	0	0	0	0	0	**36**
11:00 AM	0	0	0	0	2	6	7	5	8	0	1	0	0	0	0	0	0	**29**
12:00 PM	0	0	1	0	4	14	8	7	7	4	2	0	0	0	0	0	0	**47**
1:00 PM	0	0	1	1	2	10	8	8	6	4	1	0	0	0	0	0	0	**41**
2:00 PM	0	0	0	0	3	4	13	9	5	1	3	0	0	0	0	0	0	**38**
3:00 PM	0	0	0	4	8	15	5	6	15	1	0	1	0	0	0	0	0	**55**
4:00 PM	0	0	0	1	7	20	29	30	9	4	0	0	0	0	0	0	0	**100**
5:00 PM	0	0	1	0	7	13	17	13	9	3	1	1	0	0	0	0	0	**65**
6:00 PM	0	0	0	0	3	7	7	14	10	6	1	0	0	0	0	0	0	**48**
7:00 PM	0	0	0	1	2	3	6	3	5	2	0	0	0	0	0	0	0	**22**
8:00 PM	0	0	0	0	0	5	3	3	6	7	3	0	0	0	0	0	0	**27**
9:00 PM	0	0	0	0	0	2	0	3	0	1	0	0	0	0	0	0	0	**6**
10:00 PM	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	**3**
11:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
Total	**0**	**0**	**4**	**14**	**55**	**123**	**152**	**136**	**111**	**57**	**23**	**5**	**0**	**0**	**0**	**0**	**0**	**680**
	0.0%	**0.0%**	**0.6%**	**2.1%**	**8.1%**	**18.1%**	**22.4%**	**20.0%**	**16.3%**	**8.4%**	**3.4%**	**0.7%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			Total Study Speed Statistics		
50th Percentile (Median)	39.7	mph	Mean (Average) Speed	40.1	mph
85th Percentile	48.9	mph	10 mph Pace	33.8 - 43.8	mph
95th Percentile	54.2	mph	Percent in Pace	42.7	%

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Victory Rd E/O Provost Rd
Date Range: 12/2/2025 to 12/2/2025
Site Code: 01

Total Study Average
Westbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
1:00 AM	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	**2**
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
3:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	**2**
4:00 AM	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	**3**
5:00 AM	0	0	0	0	1	1	2	5	2	0	0	0	0	0	0	0	0	**11**
6:00 AM	0	0	0	3	4	2	6	8	3	0	0	1	0	0	0	0	0	**27**
7:00 AM	0	0	0	4	8	9	23	16	6	0	0	0	0	0	0	0	0	**66**
8:00 AM	0	0	0	2	3	2	4	7	4	1	0	0	0	0	0	0	0	**23**
9:00 AM	0	0	0	1	2	10	4	5	2	0	1	0	0	0	0	0	0	**25**
10:00 AM	0	0	0	0	6	3	7	4	1	0	0	0	0	0	0	0	0	**21**
11:00 AM	0	0	1	1	3	8	6	9	1	0	0	0	0	0	0	0	0	**29**
12:00 PM	0	0	0	1	5	2	4	10	3	1	0	0	0	0	0	0	0	**26**
1:00 PM	0	1	0	2	7	7	5	3	2	0	0	0	0	0	0	0	0	**27**
2:00 PM	0	0	1	2	7	9	9	9	2	0	0	0	0	0	0	0	0	**39**
3:00 PM	0	0	0	2	5	8	7	7	4	0	0	0	0	0	0	0	0	**33**
4:00 PM	0	0	0	4	4	7	10	16	3	0	0	0	0	0	0	0	0	**44**
5:00 PM	0	0	0	1	4	3	8	13	5	2	1	0	0	0	0	0	0	**37**
6:00 PM	0	0	0	0	4	2	10	0	3	2	0	0	0	0	0	0	0	**21**
7:00 PM	0	0	0	1	3	6	1	5	2	0	0	0	0	0	0	0	0	**18**
8:00 PM	0	0	0	1	0	2	4	3	1	1	0	0	0	0	0	0	0	**12**
9:00 PM	0	0	0	0	2	0	0	3	3	0	0	0	0	0	0	0	0	**8**
10:00 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	**2**
11:00 PM	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	**3**
Total	**0**	**1**	**2**	**26**	**69**	**85**	**110**	**126**	**48**	**9**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**479**
	0.0%	**0.2%**	**0.4%**	**5.4%**	**14.4%**	**17.7%**	**23.0%**	**26.3%**	**10.0%**	**1.9%**	**0.4%**	**0.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			Total Study Speed Statistics		
50th Percentile (Median)	37.9	mph	Mean (Average) Speed	37.0	mph
85th Percentile	44.5	mph	10 mph Pace	35.2 - 45.2	mph
95th Percentile	48.2	mph	Percent in Pace	49.5	%

TJ Wethington: 720-646-1008
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Location: Victory Rd E/O Provost Rd
Date Range: 12/2/2025 - 12/8/2025
Site Code: 01

Time	Tuesday 12/2/2025			Wednesday 12/3/2025			Thursday 12/4/2025			Friday 12/5/2025			Saturday 12/6/2025			Sunday 12/7/2025			Monday 12/8/2025			Mid-Week Average		
	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total
12:00 AM	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
1:00 AM	3	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	5
2:00 AM	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1
3:00 AM	2	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	4
4:00 AM	4	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	7
5:00 AM	13	11	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	11	24
6:00 AM	36	27	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36	27	63
7:00 AM	**44**	**66**	**110**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**44**	**66**	**110**
8:00 AM	30	23	53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	23	53
9:00 AM	29	25	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	25	54
10:00 AM	36	21	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36	21	57
11:00 AM	29	29	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	29	58
12:00 PM	47	26	73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47	26	73
1:00 PM	41	27	68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41	27	68
2:00 PM	38	39	77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38	39	77
3:00 PM	55	33	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	55	33	88
4:00 PM	**100**	**44**	**144**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**100**	**44**	**144**
5:00 PM	65	37	102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65	37	102
6:00 PM	48	21	69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	21	69
7:00 PM	22	18	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	18	40
8:00 PM	27	12	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	12	39
9:00 PM	6	8	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	8	14
10:00 PM	3	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	5
11:00 PM	1	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	4
Total	**680**	**479**	**1,159**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**680**	**479**	**1,159**
Percent	**59%**	**41%**		-	-		-	-		-	-		-	-		-	-		-	-		**59%**	**41%**	
AM Peak	07:00	07:00	07:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	07:00	07:00	07:00
Vol.	44	66	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44	66	110
PM Peak	16:00	16:00	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16:00	16:00	16:00
Vol.	100	44	144	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	44	144

1. Mid-week average includes data between Tuesday and Thursday.

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Vehicle Classification Report Summary

Location: Yule Rd S/O 38th Ave

Count Direction: Northbound / Southbound

Date Range: 12/2/2025 to 12/2/2025

Site Code: 02

Direction	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Northbound	25	110	62	3	29	45	0	0	181	15	0	0	0	470
	5.3%	23.4%	13.2%	0.6%	6.2%	9.6%	0.0%	0.0%	38.5%	3.2%	0.0%	0.0%	0.0%	
Southbound	25	136	57	6	35	44	0	0	179	19	0	0	1	502
	5.0%	27.1%	11.4%	1.2%	7.0%	8.8%	0.0%	0.0%	35.7%	3.8%	0.0%	0.0%	0.2%	
Total	50	246	119	9	64	89	0	0	360	34	0	0	1	972
	5.1%	25.3%	12.2%	0.9%	6.6%	9.2%	0.0%	0.0%	37.0%	3.5%	0.0%	0.0%	0.1%	

FHWA Vehicle Classification	
Class 1 - Motorcycles	Class 8 - Four or Fewer Axle Single-Trailer Trucks
Class 2 - Passenger Cars	Class 9 - Five-Axle Single-Trailer Trucks
Class 3 - Other Two-Axle, Four-Tire Single Unit Vehicles	Class 10 - Six or More Axle Single-Trailer Trucks
Class 4 - Buses	Class 11 - Five or fewer Axle Multi-Trailer Trucks
Class 5 - Two-Axle, Six-Tire, Single-Unit Trucks	Class 12 - Six-Axle Multi-Trailer Trucks
Class 6 - Three-Axle Single-Unit Trucks	Class 13 - Seven or More Axle Multi-Trailer Trucks
Class 7 - Four or More Axle Single-Unit Trucks	

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Location: Yule Rd S/O 38th Ave
Date Range: 12/2/2025 to 12/2/2025
Site Code: 02

Tuesday, December 2, 2025
Northbound

Time	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
12:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
1:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
3:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
4:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
5:00 AM	0	0	0	0	2	0	0	0	0	0	0	0	0	**2**
6:00 AM	0	4	0	0	0	0	0	0	0	0	0	0	0	**4**
7:00 AM	0	4	1	0	1	1	0	0	11	0	0	0	0	**18**
8:00 AM	1	2	2	0	0	3	0	0	12	0	0	0	0	**20**
9:00 AM	3	8	4	0	1	7	0	0	23	0	0	0	0	**46**
10:00 AM	4	6	2	0	1	6	0	0	23	2	0	0	0	**44**
11:00 AM	3	11	3	1	2	5	0	0	21	2	0	0	0	**48**
12:00 PM	3	9	7	2	3	5	0	0	22	4	0	0	0	**55**
1:00 PM	4	10	5	0	3	6	0	0	26	2	0	0	0	**56**
2:00 PM	1	12	0	0	0	3	0	0	27	3	0	0	0	**46**
3:00 PM	6	9	5	0	3	9	0	0	16	2	0	0	0	**50**
4:00 PM	0	14	12	0	5	0	0	0	0	0	0	0	0	**31**
5:00 PM	0	5	7	0	2	0	0	0	0	0	0	0	0	**14**
6:00 PM	0	7	3	0	1	0	0	0	0	0	0	0	0	**11**
7:00 PM	0	4	4	0	1	0	0	0	0	0	0	0	0	**9**
8:00 PM	0	1	1	0	1	0	0	0	0	0	0	0	0	**3**
9:00 PM	0	1	4	0	1	0	0	0	0	0	0	0	0	**6**
10:00 PM	0	1	1	0	1	0	0	0	0	0	0	0	0	**3**
11:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
Total	**25**	**110**	**62**	**3**	**29**	**45**	**0**	**0**	**181**	**15**	**0**	**0**	**0**	**470**
	5.3%	**23.4%**	**13.2%**	**0.6%**	**6.2%**	**9.6%**	**0.0%**	**0.0%**	**38.5%**	**3.2%**	**0.0%**	**0.0%**	**0.0%**	

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Location: Yule Rd S/O 38th Ave
Date Range: 12/2/2025 to 12/2/2025
Site Code: 02

Tuesday, December 2, 2025
Southbound

Time	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
12:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
1:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**
2:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
3:00 AM	0	2	0	0	0	0	0	0	0	0	0	0	0	**2**
4:00 AM	0	4	1	0	0	0	0	0	0	0	0	0	0	**5**
5:00 AM	0	6	2	0	4	0	0	0	0	0	0	0	0	**12**
6:00 AM	0	10	5	1	0	1	0	0	1	0	0	0	0	**18**
7:00 AM	0	16	4	0	3	0	0	0	0	0	0	0	0	**23**
8:00 AM	2	8	8	0	1	3	0	0	15	0	0	0	0	**37**
9:00 AM	3	9	2	0	1	4	0	0	24	1	0	0	0	**44**
10:00 AM	3	10	3	0	1	5	0	0	22	2	0	0	0	**46**
11:00 AM	3	16	3	1	2	7	0	0	22	4	0	0	0	**58**
12:00 PM	2	12	4	1	2	5	0	0	24	2	0	0	0	**52**
1:00 PM	3	6	2	1	2	6	0	0	23	4	0	0	0	**47**
2:00 PM	4	11	5	0	6	6	0	0	24	3	0	0	0	**59**
3:00 PM	5	4	6	0	4	5	0	0	23	3	0	0	1	**51**
4:00 PM	0	9	5	0	1	1	0	0	1	0	0	0	0	**17**
5:00 PM	0	6	3	0	4	1	0	0	0	0	0	0	0	**14**
6:00 PM	0	2	2	0	1	0	0	0	0	0	0	0	0	**5**
7:00 PM	0	2	0	1	2	0	0	0	0	0	0	0	0	**5**
8:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
9:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	**2**
10:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	**25**	**136**	**57**	**6**	**35**	**44**	**0**	**0**	**179**	**19**	**0**	**0**	**1**	**502**
	5.0%	**27.1%**	**11.4%**	**1.2%**	**7.0%**	**8.8%**	**0.0%**	**0.0%**	**35.7%**	**3.8%**	**0.0%**	**0.0%**	**0.2%**	

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Location: Yule Rd S/O 38th Ave
Date Range: 12/2/2025 to 12/2/2025
Site Code: 02

Total Study Average
Northbound

Time	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
12:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	1
1:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	1
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	1
5:00 AM	0	0	0	0	2	0	0	0	0	0	0	0	0	2
6:00 AM	0	4	0	0	0	0	0	0	0	0	0	0	0	4
7:00 AM	0	4	1	0	1	1	0	0	11	0	0	0	0	18
8:00 AM	1	2	2	0	0	3	0	0	12	0	0	0	0	20
9:00 AM	3	8	4	0	1	7	0	0	23	0	0	0	0	46
10:00 AM	4	6	2	0	1	6	0	0	23	2	0	0	0	44
11:00 AM	3	11	3	1	2	5	0	0	21	2	0	0	0	48
12:00 PM	3	9	7	2	3	5	0	0	22	4	0	0	0	55
1:00 PM	4	10	5	0	3	6	0	0	26	2	0	0	0	56
2:00 PM	1	12	0	0	0	3	0	0	27	3	0	0	0	46
3:00 PM	6	9	5	0	3	9	0	0	16	2	0	0	0	50
4:00 PM	0	14	12	0	5	0	0	0	0	0	0	0	0	31
5:00 PM	0	5	7	0	2	0	0	0	0	0	0	0	0	14
6:00 PM	0	7	3	0	1	0	0	0	0	0	0	0	0	11
7:00 PM	0	4	4	0	1	0	0	0	0	0	0	0	0	9
8:00 PM	0	1	1	0	1	0	0	0	0	0	0	0	0	3
9:00 PM	0	1	4	0	1	0	0	0	0	0	0	0	0	6
10:00 PM	0	1	1	0	1	0	0	0	0	0	0	0	0	3
11:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Total	**25**	**110**	**62**	**3**	**29**	**45**	**0**	**0**	**181**	**15**	**0**	**0**	**0**	**470**
	5.3%	**23.4%**	**13.2%**	**0.6%**	**6.2%**	**9.6%**	**0.0%**	**0.0%**	**38.5%**	**3.2%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Yule Rd S/O 38th Ave
Date Range: 12/2/2025 to 12/2/2025
Site Code: 02

Total Study Average
Southbound

Time	FHWA Vehicle Classification													Total Volume
	1	2	3	4	5	6	7	8	9	10	11	12	13	
12:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	1
1:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	1
2:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3:00 AM	0	2	0	0	0	0	0	0	0	0	0	0	0	2
4:00 AM	0	4	1	0	0	0	0	0	0	0	0	0	0	5
5:00 AM	0	6	2	0	4	0	0	0	0	0	0	0	0	12
6:00 AM	0	10	5	1	0	1	0	0	1	0	0	0	0	18
7:00 AM	0	16	4	0	3	0	0	0	0	0	0	0	0	23
8:00 AM	2	8	8	0	1	3	0	0	15	0	0	0	0	37
9:00 AM	3	9	2	0	1	4	0	0	24	1	0	0	0	44
10:00 AM	3	10	3	0	1	5	0	0	22	2	0	0	0	46
11:00 AM	3	16	3	1	2	7	0	0	22	4	0	0	0	58
12:00 PM	2	12	4	1	2	5	0	0	24	2	0	0	0	52
1:00 PM	3	6	2	1	2	6	0	0	23	4	0	0	0	47
2:00 PM	4	11	5	0	6	6	0	0	24	3	0	0	0	59
3:00 PM	5	4	6	0	4	5	0	0	23	3	0	0	1	51
4:00 PM	0	9	5	0	1	1	0	0	1	0	0	0	0	17
5:00 PM	0	6	3	0	4	1	0	0	0	0	0	0	0	14
6:00 PM	0	2	2	0	1	0	0	0	0	0	0	0	0	5
7:00 PM	0	2	0	1	2	0	0	0	0	0	0	0	0	5
8:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	1
9:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	2
10:00 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	1
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**25**	**136**	**57**	**6**	**35**	**44**	**0**	**0**	**179**	**19**	**0**	**0**	**1**	**502**
	5.0%	**27.1%**	**11.4%**	**1.2%**	**7.0%**	**8.8%**	**0.0%**	**0.0%**	**35.7%**	**3.8%**	**0.0%**	**0.0%**	**0.2%**	

Note: Average only condsidered on days with 24-hours of data.

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Vehicle Speed Report Summary

Location: Yule Rd S/O 38th Ave

Direction: Northbound / Southbound

Date Range: 12/2/2025 to 12/2/2025

Site Code: 02

Direction	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
Northbound	5	12	16	45	89	114	70	31	25	31	18	11	2	0	1	0	0	470
	1.1%	2.6%	3.4%	9.6%	18.9%	24.3%	14.9%	6.6%	5.3%	6.6%	3.8%	2.3%	0.4%	0.0%	0.2%	0.0%	0.0%	
Southbound	0	0	92	185	36	23	32	43	45	27	17	2	0	0	0	0	0	502
	0.0%	0.0%	18.3%	36.9%	7.2%	4.6%	6.4%	8.6%	9.0%	5.4%	3.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	
Total	5	12	108	230	125	137	102	74	70	58	35	13	2	0	1	0	0	972
	0.5%	1.2%	11.1%	23.7%	12.9%	14.1%	10.5%	7.6%	7.2%	6.0%	3.6%	1.3%	0.2%	0.0%	0.1%	0.0%	0.0%	

Total Study Percentile Speed Summary			Total Study Speed Statistics		
Northbound			**Northbound**		
50th Percentile (Median)	32.3	mph	Mean (Average) Speed	34.7	mph
85th Percentile	47.8	mph	10 mph Pace	26.1 - 36.1	mph
95th Percentile	56.6	mph	Percent in Pace	46.0	%
Southbound			**Southbound**		
50th Percentile (Median)	23.8	mph	Mean (Average) Speed	30.2	mph
85th Percentile	46.9	mph	10 mph Pace	16.6 - 26.6	mph
95th Percentile	54.2	mph	Percent in Pace	59.2	%

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Yule Rd S/O 38th Ave
Date Range: 12/2/2025 to 12/2/2025
Site Code: 02

Tuesday, December 2, 2025
Northbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
1:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
3:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
4:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
5:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	**2**
6:00 AM	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	**4**
7:00 AM	0	0	0	2	8	4	2	1	0	0	1	0	0	0	0	0	0	**18**
8:00 AM	0	0	0	3	3	9	5	0	0	0	0	0	0	0	0	0	0	**20**
9:00 AM	1	2	5	3	8	15	4	1	3	2	0	1	1	0	0	0	0	**46**
10:00 AM	0	3	1	5	14	9	11	0	0	1	0	0	0	0	0	0	0	**44**
11:00 AM	1	3	2	4	7	15	11	4	0	0	1	0	0	0	0	0	0	**48**
12:00 PM	1	3	1	9	11	18	5	3	3	0	1	0	0	0	0	0	0	**55**
1:00 PM	2	0	2	9	12	13	5	4	4	3	2	0	0	0	0	0	0	**56**
2:00 PM	0	0	1	1	14	19	7	1	1	1	1	0	0	0	0	0	0	**46**
3:00 PM	0	1	4	9	12	10	8	1	1	2	0	2	0	0	0	0	0	**50**
4:00 PM	0	0	0	0	0	1	5	5	7	7	3	3	0	0	0	0	0	**31**
5:00 PM	0	0	0	0	0	0	1	0	3	4	3	3	0	0	0	0	0	**14**
6:00 PM	0	0	0	0	0	1	1	2	0	4	1	0	1	0	1	0	0	**11**
7:00 PM	0	0	0	0	0	0	1	3	1	3	1	0	0	0	0	0	0	**9**
8:00 PM	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	**3**
9:00 PM	0	0	0	0	0	0	0	2	1	2	1	0	0	0	0	0	0	**6**
10:00 PM	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	**3**
11:00 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**
Total	**5**	**12**	**16**	**45**	**89**	**114**	**70**	**31**	**25**	**31**	**18**	**11**	**2**	**0**	**1**	**0**	**0**	**470**
	1.1%	**2.6%**	**3.4%**	**9.6%**	**18.9%**	**24.3%**	**14.9%**	**6.6%**	**5.3%**	**6.6%**	**3.8%**	**2.3%**	**0.4%**	**0.0%**	**0.2%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	32.3	mph	Mean (Average) Speed	34.7	mph
85th Percentile	47.8	mph	10 mph Pace	26.1 - 36.1	mph
95th Percentile	56.6	mph	Percent in Pace	46.0	%

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Yule Rd S/O 38th Ave
Date Range: 12/2/2025 to 12/2/2025
Site Code: 02

Tuesday, December 2, 2025
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
1:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
2:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
3:00 AM	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	**2**
4:00 AM	0	0	0	0	0	3	0	0	1	1	0	0	0	0	0	0	0	**5**
5:00 AM	0	0	0	0	1	2	3	5	0	1	0	0	0	0	0	0	0	**12**
6:00 AM	0	0	0	1	0	1	3	2	4	2	4	1	0	0	0	0	0	**18**
7:00 AM	0	0	0	1	0	3	1	8	5	3	2	0	0	0	0	0	0	**23**
8:00 AM	0	0	6	15	0	2	4	1	3	5	1	0	0	0	0	0	0	**37**
9:00 AM	0	0	8	24	2	0	0	3	4	3	0	0	0	0	0	0	0	**44**
10:00 AM	0	0	12	22	3	0	1	4	2	1	1	0	0	0	0	0	0	**46**
11:00 AM	0	0	14	22	5	2	4	2	5	2	1	1	0	0	0	0	0	**58**
12:00 PM	0	0	11	24	8	2	2	1	3	1	0	0	0	0	0	0	0	**52**
1:00 PM	0	0	13	22	5	2	2	2	1	0	0	0	0	0	0	0	0	**47**
2:00 PM	0	0	11	30	4	1	4	4	3	2	0	0	0	0	0	0	0	**59**
3:00 PM	0	0	14	22	5	1	3	2	1	2	1	0	0	0	0	0	0	**51**
4:00 PM	0	0	3	1	2	0	3	1	3	2	2	0	0	0	0	0	0	**17**
5:00 PM	0	0	0	0	1	2	1	1	6	1	2	0	0	0	0	0	0	**14**
6:00 PM	0	0	0	0	0	0	0	2	1	0	2	0	0	0	0	0	0	**5**
7:00 PM	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	**5**
8:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
9:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	**2**
10:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**92**	**185**	**36**	**23**	**32**	**43**	**45**	**27**	**17**	**2**	**0**	**0**	**0**	**0**	**0**	**502**
	0.0%	**0.0%**	**18.3%**	**36.9%**	**7.2%**	**4.6%**	**6.4%**	**8.6%**	**9.0%**	**5.4%**	**3.4%**	**0.4%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Daily Percentile Speed Summary			Speed Statistics		
50th Percentile (Median)	23.8	mph	Mean (Average) Speed	30.2	mph
85th Percentile	46.9	mph	10 mph Pace	16.6 - 26.6	mph
95th Percentile	54.2	mph	Percent in Pace	59.16	%

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Yule Rd S/O 38th Ave
Date Range: 12/2/2025 to 12/2/2025
Site Code: 02

Total Study Average
Northbound

Time	Speed Range (mph)																Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
1:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**1**
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
3:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
4:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
5:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	**2**
6:00 AM	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	**4**
7:00 AM	0	0	0	2	8	4	2	1	0	0	1	0	0	0	0	0	0	**18**
8:00 AM	0	0	0	3	3	9	5	0	0	0	0	0	0	0	0	0	0	**20**
9:00 AM	1	2	5	3	8	15	4	1	3	2	0	1	1	0	0	0	0	**46**
10:00 AM	0	3	1	5	14	9	11	0	0	1	0	0	0	0	0	0	0	**44**
11:00 AM	1	3	2	4	7	15	11	4	0	0	1	0	0	0	0	0	0	**48**
12:00 PM	1	3	1	9	11	18	5	3	3	0	1	0	0	0	0	0	0	**55**
1:00 PM	2	0	2	9	12	13	5	4	4	3	2	0	0	0	0	0	0	**56**
2:00 PM	0	0	1	1	14	19	7	1	1	1	1	0	0	0	0	0	0	**46**
3:00 PM	0	1	4	9	12	10	8	1	1	2	0	2	0	0	0	0	0	**50**
4:00 PM	0	0	0	0	0	1	5	5	7	7	3	3	0	0	0	0	0	**31**
5:00 PM	0	0	0	0	0	0	1	0	3	4	3	3	0	0	0	0	0	**14**
6:00 PM	0	0	0	0	0	1	1	2	0	4	1	0	1	0	1	0	0	**11**
7:00 PM	0	0	0	0	0	0	1	3	1	3	1	0	0	0	0	0	0	**9**
8:00 PM	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	**3**
9:00 PM	0	0	0	0	0	0	0	2	1	2	1	0	0	0	0	0	0	**6**
10:00 PM	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	**3**
11:00 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**
Total	**5**	**12**	**16**	**45**	**89**	**114**	**70**	**31**	**25**	**31**	**18**	**11**	**2**	**0**	**1**	**0**	**0**	**470**
	1.1%	**2.6%**	**3.4%**	**9.6%**	**18.9%**	**24.3%**	**14.9%**	**6.6%**	**5.3%**	**6.6%**	**3.8%**	**2.3%**	**0.4%**	**0.0%**	**0.2%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			Total Study Speed Statistics		
50th Percentile (Median)	32.3	mph	Mean (Average) Speed	34.7	mph
85th Percentile	47.8	mph	10 mph Pace	26.1 - 36.1	mph
95th Percentile	56.6	mph	Percent in Pace	46.0	%

TJ Wethington: 720-646-1008
tj.wethington@idaxdata.com

Location: Yule Rd S/O 38th Ave
Date Range: 12/2/2025 to 12/2/2025
Site Code: 02

idax DATA SOLUTIONS

Total Study Average
Southbound

Time	Speed Range (mph)																	Total Volume
	0 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 +	
12:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
1:00 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
2:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
3:00 AM	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	**2**
4:00 AM	0	0	0	0	0	3	0	0	1	1	0	0	0	0	0	0	0	**5**
5:00 AM	0	0	0	0	1	2	3	5	0	1	0	0	0	0	0	0	0	**12**
6:00 AM	0	0	0	1	0	1	3	2	4	2	4	1	0	0	0	0	0	**18**
7:00 AM	0	0	0	1	0	3	1	8	5	3	2	0	0	0	0	0	0	**23**
8:00 AM	0	0	6	15	0	2	4	1	3	5	1	0	0	0	0	0	0	**37**
9:00 AM	0	0	8	24	2	0	0	3	4	3	0	0	0	0	0	0	0	**44**
10:00 AM	0	0	12	22	3	0	1	4	2	1	1	0	0	0	0	0	0	**46**
11:00 AM	0	0	14	22	5	2	4	2	5	2	1	1	0	0	0	0	0	**58**
12:00 PM	0	0	11	24	8	2	2	1	3	1	0	0	0	0	0	0	0	**52**
1:00 PM	0	0	13	22	5	2	2	2	1	0	0	0	0	0	0	0	0	**47**
2:00 PM	0	0	11	30	4	1	4	4	3	2	0	0	0	0	0	0	0	**59**
3:00 PM	0	0	14	22	5	1	3	2	1	2	1	0	0	0	0	0	0	**51**
4:00 PM	0	0	3	1	2	0	3	1	3	2	2	0	0	0	0	0	0	**17**
5:00 PM	0	0	0	0	1	2	1	1	6	1	2	0	0	0	0	0	0	**14**
6:00 PM	0	0	0	0	0	0	0	2	1	0	2	0	0	0	0	0	0	**5**
7:00 PM	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	**5**
8:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
9:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	**2**
10:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total	**0**	**0**	**92**	**185**	**36**	**23**	**32**	**43**	**45**	**27**	**17**	**2**	**0**	**0**	**0**	**0**	**0**	**502**
	0.0%	**0.0%**	**18.3%**	**36.9%**	**7.2%**	**4.6%**	**6.4%**	**8.6%**	**9.0%**	**5.4%**	**3.4%**	**0.4%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Note: Average only condsidered on days with 24-hours of data.

Total Study Percentile Speed Summary			Total Study Speed Statistics		
50th Percentile (Median)	23.8	mph	Mean (Average) Speed	30.2	mph
85th Percentile	46.9	mph	10 mph Pace	16.6 - 26.6	mph
95th Percentile	54.2	mph	Percent in Pace	59.2	%

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Location: Yule Rd S/O 38th Ave
Date Range: 12/2/2025 - 12/8/2025
Site Code: 02

Time	Tuesday 12/2/2025			Wednesday 12/3/2025			Thursday 12/4/2025			Friday 12/5/2025			Saturday 12/6/2025			Sunday 12/7/2025			Monday 12/8/2025			Mid-Week Average		
	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2
1:00 AM	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2
2:00 AM	0	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1
3:00 AM	0	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	2
4:00 AM	1	5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5	6
5:00 AM	2	12	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	12	14
6:00 AM	4	18	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	18	22
7:00 AM	18	23	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	23	41
8:00 AM	20	37	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	37	57
9:00 AM	46	44	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	44	90
10:00 AM	44	46	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44	46	90
11:00 AM	**48**	**58**	**106**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**48**	**58**	**106**
12:00 PM	55	52	**107**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	55	52	**107**
1:00 PM	**56**	47	103	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**56**	47	103
2:00 PM	46	**59**	105	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	**59**	105
3:00 PM	50	51	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	51	101
4:00 PM	31	17	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31	17	48
5:00 PM	14	14	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	14	28
6:00 PM	11	5	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	5	16
7:00 PM	9	5	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	5	14
8:00 PM	3	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	4
9:00 PM	6	2	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	2	8
10:00 PM	3	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	4
11:00 PM	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1
Total	**470**	**502**	**972**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**470**	**502**	**972**
Percent	**48%**	**52%**		-	-		-	-		-	-		-	-		-	-		-	-		**48%**	**52%**	
AM Peak	11:00	11:00	11:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11:00	11:00	11:00
Vol.	48	58	106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48	58	106
PM Peak	13:00	14:00	12:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13:00	14:00	12:00
Vol.	56	59	107	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56	59	107

1. Mid-week average includes data between Tuesday and Thursday.

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Level of Service Definitions

LEVEL OF SERVICE DEFINITIONS

In rating roadway and intersection operating conditions with existing or future traffic volumes, "Levels of Service" (LOS) A through F are used, with LOS A indicating very good operation and LOS F indicating poor operation. Levels of service at signalized and unsignalized intersections are closely associated with vehicle delays experienced in seconds per vehicle. More complete level of service definitions and delay data for signal and stop sign controlled intersections are contained in the following table for reference.

Level of Service Rating	Delay in seconds per vehicle *(a)*		Definition
	Signalized	Unsignalized	
A	0.0 to 10.0	0.0 to 10.0	Low vehicular traffic volumes; primarily free flow operations. Density is low and vehicles can freely maneuver within the traffic stream. Drivers are able to maintain their desired speeds with little or no delay.
B	10.1 to 20.0	10.1 to 15.0	Stable vehicular traffic volume flow with potential for some restriction of operating speeds due to traffic conditions. Vehicle maneuvering is only slightly restricted. The stopped delays are not bothersome and drivers are not subject to appreciable tension.
C	20.1 to 35.0	15.1 to 25.0	Stable traffic operations, however the ability for vehicles to maneuver is more restricted by the increase in traffic volumes. Relatively satisfactory operating speeds prevail, but adverse signal coordination or longer vehicle queues cause delays along the corridor.
D	35.1 to 55.0	25.1 to 35.0	Approaching unstable vehicular traffic flow where small increases in volume could cause substantial delays. Most drivers are restricted in ability to maneuver and selection of travel speeds due to congestion. Driver comfort and convenience are low, but tolerable.
E	55.1 to 80.0	35.1 to 50.0	Traffic operations characterized by significant approach delays and average travel speeds of one-half to one-third the free flow speed. Vehicular flow is unstable and there is potential for stoppages of brief duration. High signal density, extensive vehicle queuing, or corridor signal progression/timing are the typical causes of vehicle delays at signalized corridors.
F	> 80.0	> 50.0	Forced vehicular traffic flow and operations with high approach delays at critical intersections. Vehicle speeds are reduced substantially, and stoppages may occur for short or long periods of time because of downstream congestion.

(a) Delay ranges based on Highway Capacity Manual (6th Edition, 2016) criteria.

Intersection Capacity Worksheets: Existing

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	32	50	0	2	15
Future Vol, veh/h	11	32	50	0	2	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	78	78	47	47
Heavy Vehicles, %	12	12	16	16	12	12
Mvmt Flow	18	53	64	0	4	32

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	64	0	-	0	154	64
Stage 1	-	-	-	-	64	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	4.22	-	-	-	6.52	6.32
Critical Hdwy Stg 1	-	-	-	-	5.52	-
Critical Hdwy Stg 2	-	-	-	-	5.52	-
Follow-up Hdwy	2.308	-	-	-	3.608	3.408
Pot Cap-1 Maneuver	1477	-	-	-	815	973
Stage 1	-	-	-	-	934	-
Stage 2	-	-	-	-	909	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1477	-	-	-	804	973
Mov Cap-2 Maneuver	-	-	-	-	804	-
Stage 1	-	-	-	-	922	-
Stage 2	-	-	-	-	909	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.91	0	8.94
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	460	-	-	-	949
HCM Lane V/C Ratio	0.012	-	-	-	0.038
HCM Ctrl Dly (s/v)	7.5	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	7.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	17	0	2	18	3
Future Vol, veh/h	3	17	0	2	18	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	63	50	50	40	40
Heavy Vehicles, %	63	63	50	50	95	95
Mvmt Flow	5	27	0	4	45	8

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	100	2	0	0	4	0
Stage 1	2	-	-	-	-	-
Stage 2	98	-	-	-	-	-
Critical Hdwy	7.03	6.83	-	-	5.05	-
Critical Hdwy Stg 1	6.03	-	-	-	-	-
Critical Hdwy Stg 2	6.03	-	-	-	-	-
Follow-up Hdwy	4.067	3.867	-	-	3.055	-
Pot Cap-1 Maneuver	771	928	-	-	1174	-
Stage 1	883	-	-	-	-	-
Stage 2	794	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	741	928	-	-	1174	-
Mov Cap-2 Maneuver	741	-	-	-	-	-
Stage 1	883	-	-	-	-	-
Stage 2	763	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.17	0	7.02
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	894	1169	-
HCM Lane V/C Ratio	-	-	0.035	0.038	-
HCM Ctrl Dly (s/v)	-	-	9.2	8.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	22	16	2	13	4
Future Vol, veh/h	1	22	16	2	13	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	48	48	50	50	39	39
Heavy Vehicles, %	78	78	83	83	18	18
Mvmt Flow	2	46	32	4	33	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	106	38	44	0	-	0
Stage 1	38	-	-	-	-	-
Stage 2	68	-	-	-	-	-
Critical Hdwy	7.18	6.98	4.93	-	-	-
Critical Hdwy Stg 1	6.18	-	-	-	-	-
Critical Hdwy Stg 2	6.18	-	-	-	-	-
Follow-up Hdwy	4.202	4.002	2.947	-	-	-
Pot Cap-1 Maneuver	737	853	1171	-	-	-
Stage 1	820	-	-	-	-	-
Stage 2	793	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	717	853	1171	-	-	-
Mov Cap-2 Maneuver	717	-	-	-	-	-
Stage 1	798	-	-	-	-	-
Stage 2	793	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	9.51	7.25	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1169	-	846	-	-
HCM Lane V/C Ratio	0.027	-	0.057	-	-
HCM Ctrl Dly (s/v)	8.2	0	9.5	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	24	77	33	1	0	11
Future Vol, veh/h	24	77	33	1	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	77	77	65	65	55	55
Heavy Vehicles, %	9	9	12	12	2	2
Mvmt Flow	31	100	51	2	0	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	52	0	-	0	214	52
Stage 1	-	-	-	-	52	-
Stage 2	-	-	-	-	162	-
Critical Hdwy	4.19	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.281	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1510	-	-	-	774	1016
Stage 1	-	-	-	-	971	-
Stage 2	-	-	-	-	867	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1510	-	-	-	757	1016
Mov Cap-2 Maneuver	-	-	-	-	757	-
Stage 1	-	-	-	-	950	-
Stage 2	-	-	-	-	867	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.77	0	8.61
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	428	-	-	-	1016
HCM Lane V/C Ratio	0.021	-	-	-	0.02
HCM Ctrl Dly (s/v)	7.4	0	-	-	8.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	4.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	1	1	5	3	1
Future Vol, veh/h	3	1	1	5	3	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	50	50	50	50
Heavy Vehicles, %	2	2	2	2	50	50
Mvmt Flow	6	2	2	10	6	2

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	21	7	0	0	12	0
Stage 1	7	-	-	-	-	-
Stage 2	14	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.6	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.65	-
Pot Cap-1 Maneuver	996	1075	-	-	1344	-
Stage 1	1016	-	-	-	-	-
Stage 2	1009	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	991	1075	-	-	1344	-
Mov Cap-2 Maneuver	991	-	-	-	-	-
Stage 1	1016	-	-	-	-	-
Stage 2	1004	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	8.59	0	5.77
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1011	1342	-
HCM Lane V/C Ratio	-	-	0.008	0.004	-
HCM Ctrl Dly (s/v)	-	-	8.6	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	7	7	24	10	0
Future Vol, veh/h	1	7	7	24	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	67	67	78	78	83	83
Heavy Vehicles, %	38	38	3	3	10	10
Mvmt Flow	1	10	9	31	12	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	61	12	12	0	-	0
Stage 1	12	-	-	-	-	-
Stage 2	49	-	-	-	-	-
Critical Hdwy	6.78	6.58	4.13	-	-	-
Critical Hdwy Stg 1	5.78	-	-	-	-	-
Critical Hdwy Stg 2	5.78	-	-	-	-	-
Follow-up Hdwy	3.842	3.642	2.227	-	-	-
Pot Cap-1 Maneuver	863	973	1600	-	-	-
Stage 1	925	-	-	-	-	-
Stage 2	889	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	858	973	1600	-	-	-
Mov Cap-2 Maneuver	858	-	-	-	-	-
Stage 1	920	-	-	-	-	-
Stage 2	889	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	8.81	1.64	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	406	-	957	-	-
HCM Lane V/C Ratio	0.006	-	0.012	-	-
HCM Ctrl Dly (s/v)	7.3	0	8.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection Capacity Worksheets: Year 2026 Background

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	33	51	3	5	15
Future Vol, veh/h	11	33	51	3	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	78	78	47	47
Heavy Vehicles, %	12	12	16	16	12	12
Mvmt Flow	18	55	65	4	11	32

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	69	0	-	0	159	67
Stage 1	-	-	-	-	67	-
Stage 2	-	-	-	-	92	-
Critical Hdwy	4.22	-	-	-	6.52	6.32
Critical Hdwy Stg 1	-	-	-	-	5.52	-
Critical Hdwy Stg 2	-	-	-	-	5.52	-
Follow-up Hdwy	2.308	-	-	-	3.608	3.408
Pot Cap-1 Maneuver	1470	-	-	-	809	969
Stage 1	-	-	-	-	931	-
Stage 2	-	-	-	-	907	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1470	-	-	-	799	969
Mov Cap-2 Maneuver	-	-	-	-	799	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	907	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.87	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1470	-	-	-	920
HCM Lane V/C Ratio	0.012	-	-	-	0.046
HCM Ctrl Dly (s/v)	7.5	-	-	-	9.1
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	17	3	2	18	3
Future Vol, veh/h	3	17	3	2	18	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	63	50	50	40	40
Heavy Vehicles, %	63	63	50	50	95	95
Mvmt Flow	5	27	6	4	45	8

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	106	8	0	0	10	0
Stage 1	8	-	-	-	-	-
Stage 2	98	-	-	-	-	-
Critical Hdwy	7.03	6.83	-	-	5.05	-
Critical Hdwy Stg 1	6.03	-	-	-	-	-
Critical Hdwy Stg 2	6.03	-	-	-	-	-
Follow-up Hdwy	4.067	3.867	-	-	3.055	-
Pot Cap-1 Maneuver	764	921	-	-	1167	-
Stage 1	877	-	-	-	-	-
Stage 2	794	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	735	921	-	-	1167	-
Mov Cap-2 Maneuver	735	-	-	-	-	-
Stage 1	877	-	-	-	-	-
Stage 2	763	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.21	0	7.04
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	887	1162	-
HCM Lane V/C Ratio	-	-	0.036	0.039	-
HCM Ctrl Dly (s/v)	-	-	9.2	8.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	22	16	5	13	7
Future Vol, veh/h	4	22	16	5	13	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	48	48	50	50	39	39
Heavy Vehicles, %	78	78	83	83	18	18
Mvmt Flow	8	46	32	10	33	18

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	116	42	51	0	-	0
Stage 1	42	-	-	-	-	-
Stage 2	74	-	-	-	-	-
Critical Hdwy	7.18	6.98	4.93	-	-	-
Critical Hdwy Stg 1	6.18	-	-	-	-	-
Critical Hdwy Stg 2	6.18	-	-	-	-	-
Follow-up Hdwy	4.202	4.002	2.947	-	-	-
Pot Cap-1 Maneuver	727	848	1163	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	788	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	706	848	1163	-	-	-
Mov Cap-2 Maneuver	706	-	-	-	-	-
Stage 1	794	-	-	-	-	-
Stage 2	788	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	9.68	6.24	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1156	-	823	-	-
HCM Lane V/C Ratio	0.028	-	0.066	-	-
HCM Ctrl Dly (s/v)	8.2	0	9.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	79	34	4	3	11
Future Vol, veh/h	25	79	34	4	3	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	77	77	65	65	55	55
Heavy Vehicles, %	9	9	12	12	2	2
Mvmt Flow	32	103	52	6	5	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	58	0	-	0	223	55
Stage 1	-	-	-	-	55	-
Stage 2	-	-	-	-	168	-
Critical Hdwy	4.19	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.281	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1502	-	-	-	765	1011
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1502	-	-	-	749	1011
Mov Cap-2 Maneuver	-	-	-	-	749	-
Stage 1	-	-	-	-	946	-
Stage 2	-	-	-	-	862	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.79	0	8.93
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1502	-	-	-	941
HCM Lane V/C Ratio	0.022	-	-	-	0.027
HCM Ctrl Dly (s/v)	7.4	-	-	-	8.9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	4	4	5	3	4
Future Vol, veh/h	3	4	4	5	3	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	50	50	50	50
Heavy Vehicles, %	2	2	2	2	50	50
Mvmt Flow	6	8	8	10	6	8

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	33	13	0	0	18	0
Stage 1	13	-	-	-	-	-
Stage 2	20	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.6	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.65	-
Pot Cap-1 Maneuver	980	1067	-	-	1336	-
Stage 1	1010	-	-	-	-	-
Stage 2	1003	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	976	1067	-	-	1336	-
Mov Cap-2 Maneuver	976	-	-	-	-	-
Stage 1	1010	-	-	-	-	-
Stage 2	998	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	8.56	0	3.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1026	771	-
HCM Lane V/C Ratio	-	-	0.014	0.004	-
HCM Ctrl Dly (s/v)	-	-	8.6	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	7	7	25	10	3
Future Vol, veh/h	4	7	7	25	10	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	67	67	78	78	83	83
Heavy Vehicles, %	38	38	3	3	10	10
Mvmt Flow	6	10	9	32	12	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	64	14	16	0	-	0
Stage 1	14	-	-	-	-	-
Stage 2	50	-	-	-	-	-
Critical Hdwy	6.78	6.58	4.13	-	-	-
Critical Hdwy Stg 1	5.78	-	-	-	-	-
Critical Hdwy Stg 2	5.78	-	-	-	-	-
Follow-up Hdwy	3.842	3.642	2.227	-	-	-
Pot Cap-1 Maneuver	859	971	1595	-	-	-
Stage 1	923	-	-	-	-	-
Stage 2	888	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	855	971	1595	-	-	-
Mov Cap-2 Maneuver	855	-	-	-	-	-
Stage 1	918	-	-	-	-	-
Stage 2	888	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	8.96	1.59	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	394	-	925	-	-
HCM Lane V/C Ratio	0.006	-	0.018	-	-
HCM Ctrl Dly (s/v)	7.3	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection Capacity Worksheets: Year 2045 Background

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	49	76	5	8	22
Future Vol, veh/h	16	49	76	5	8	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	78	78	47	47
Heavy Vehicles, %	12	12	16	16	12	12
Mvmt Flow	27	82	97	6	17	47

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	104	0	-	0	236	101
Stage 1	-	-	-	-	101	-
Stage 2	-	-	-	-	135	-
Critical Hdwy	4.22	-	-	-	6.52	6.32
Critical Hdwy Stg 1	-	-	-	-	5.52	-
Critical Hdwy Stg 2	-	-	-	-	5.52	-
Follow-up Hdwy	2.308	-	-	-	3.608	3.408
Pot Cap-1 Maneuver	1428	-	-	-	731	928
Stage 1	-	-	-	-	899	-
Stage 2	-	-	-	-	867	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1428	-	-	-	717	928
Mov Cap-2 Maneuver	-	-	-	-	717	-
Stage 1	-	-	-	-	882	-
Stage 2	-	-	-	-	867	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.86	0	9.52
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1428	-	-	-	861
HCM Lane V/C Ratio	0.019	-	-	-	0.074
HCM Ctrl Dly (s/v)	7.6	-	-	-	9.5
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Intersection	
Int Delay, s/veh	7.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	25	5	3	27	4
Future Vol, veh/h	4	25	5	3	27	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	63	50	50	40	40
Heavy Vehicles, %	63	63	50	50	95	95
Mvmt Flow	6	40	10	6	68	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	158	13	0	0	16	0
Stage 1	13	-	-	-	-	-
Stage 2	145	-	-	-	-	-
Critical Hdwy	7.03	6.83	-	-	5.05	-
Critical Hdwy Stg 1	6.03	-	-	-	-	-
Critical Hdwy Stg 2	6.03	-	-	-	-	-
Follow-up Hdwy	4.067	3.867	-	-	3.055	-
Pot Cap-1 Maneuver	710	915	-	-	1160	-
Stage 1	872	-	-	-	-	-
Stage 2	753	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	668	915	-	-	1160	-
Mov Cap-2 Maneuver	668	-	-	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	709	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.37	0	7.22
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	870	1154	-
HCM Lane V/C Ratio	-	-	0.053	0.058	-
HCM Ctrl Dly (s/v)	-	-	9.4	8.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.2	-

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	33	24	8	19	11
Future Vol, veh/h	6	33	24	8	19	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	48	48	50	50	39	39
Heavy Vehicles, %	78	78	83	83	18	18
Mvmt Flow	13	69	48	16	49	28

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	175	63	77	0	-	0
Stage 1	63	-	-	-	-	-
Stage 2	112	-	-	-	-	-
Critical Hdwy	7.18	6.98	4.93	-	-	-
Critical Hdwy Stg 1	6.18	-	-	-	-	-
Critical Hdwy Stg 2	6.18	-	-	-	-	-
Follow-up Hdwy	4.202	4.002	2.947	-	-	-
Pot Cap-1 Maneuver	668	825	1134	-	-	-
Stage 1	798	-	-	-	-	-
Stage 2	754	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	640	825	1134	-	-	-
Mov Cap-2 Maneuver	640	-	-	-	-	-
Stage 1	764	-	-	-	-	-
Stage 2	754	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	10.08	6.24	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1124	-	789	-	-
HCM Lane V/C Ratio	0.042	-	0.103	-	-
HCM Ctrl Dly (s/v)	8.3	0	10.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	37	118	51	6	5	16
Future Vol, veh/h	37	118	51	6	5	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	77	77	65	65	55	55
Heavy Vehicles, %	9	9	12	12	2	2
Mvmt Flow	48	153	78	9	9	29

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	88	0	-	0	332	83
Stage 1	-	-	-	-	83	-
Stage 2	-	-	-	-	249	-
Critical Hdwy	4.19	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.281	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1465	-	-	-	662	976
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	792	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1465	-	-	-	641	976
Mov Cap-2 Maneuver	-	-	-	-	641	-
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	792	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.8	0	9.34
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1465	-	-	-	868
HCM Lane V/C Ratio	0.033	-	-	-	0.044
HCM Ctrl Dly (s/v)	7.5	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	6	6	7	4	4
Future Vol, veh/h	4	6	6	7	4	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	50	50	50	50
Heavy Vehicles, %	2	2	2	2	50	50
Mvmt Flow	8	12	12	14	8	8

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	43	19	0	0	26	0
Stage 1	19	-	-	-	-	-
Stage 2	24	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.6	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.65	-
Pot Cap-1 Maneuver	968	1059	-	-	1327	-
Stage 1	1004	-	-	-	-	-
Stage 2	999	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	962	1059	-	-	1327	-
Mov Cap-2 Maneuver	962	-	-	-	-	-
Stage 1	1004	-	-	-	-	-
Stage 2	993	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	8.61	0	3.86
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1018	900	-
HCM Lane V/C Ratio	-	-	0.02	0.006	-
HCM Ctrl Dly (s/v)	-	-	8.6	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	10	10	37	15	5
Future Vol, veh/h	6	10	10	37	15	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	67	67	78	78	83	83
Heavy Vehicles, %	38	38	3	3	10	10
Mvmt Flow	9	15	13	47	18	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	94	21	24	0	-	0
Stage 1	21	-	-	-	-	-
Stage 2	73	-	-	-	-	-
Critical Hdwy	6.78	6.58	4.13	-	-	-
Critical Hdwy Stg 1	5.78	-	-	-	-	-
Critical Hdwy Stg 2	5.78	-	-	-	-	-
Follow-up Hdwy	3.842	3.642	2.227	-	-	-
Pot Cap-1 Maneuver	825	961	1584	-	-	-
Stage 1	916	-	-	-	-	-
Stage 2	866	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	818	961	1584	-	-	-
Mov Cap-2 Maneuver	818	-	-	-	-	-
Stage 1	908	-	-	-	-	-
Stage 2	866	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	9.1	1.55	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	383	-	902	-	-
HCM Lane V/C Ratio	0.008	-	0.026	-	-
HCM Ctrl Dly (s/v)	7.3	0	9.1	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection Capacity Worksheets: Year 2026 Background+ Project

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	33	51	3	5	15
Future Vol, veh/h	11	33	51	3	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	78	78	47	47
Heavy Vehicles, %	12	12	16	16	12	12
Mvmt Flow	18	55	65	4	11	32

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	69	0	-	0	159	67
Stage 1	-	-	-	-	67	-
Stage 2	-	-	-	-	92	-
Critical Hdwy	4.22	-	-	-	6.52	6.32
Critical Hdwy Stg 1	-	-	-	-	5.52	-
Critical Hdwy Stg 2	-	-	-	-	5.52	-
Follow-up Hdwy	2.308	-	-	-	3.608	3.408
Pot Cap-1 Maneuver	1470	-	-	-	809	969
Stage 1	-	-	-	-	931	-
Stage 2	-	-	-	-	907	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1470	-	-	-	799	969
Mov Cap-2 Maneuver	-	-	-	-	799	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	907	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.87	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1470	-	-	-	920
HCM Lane V/C Ratio	0.012	-	-	-	0.046
HCM Ctrl Dly (s/v)	7.5	-	-	-	9.1
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	7.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	29	3	2	30	3
Future Vol, veh/h	3	29	3	2	30	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	63	50	50	40	40
Heavy Vehicles, %	63	63	50	50	95	95
Mvmt Flow	5	46	6	4	75	8

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	166	8	0	0	10	0
Stage 1	8	-	-	-	-	-
Stage 2	158	-	-	-	-	-
Critical Hdwy	7.03	6.83	-	-	5.05	-
Critical Hdwy Stg 1	6.03	-	-	-	-	-
Critical Hdwy Stg 2	6.03	-	-	-	-	-
Follow-up Hdwy	4.067	3.867	-	-	3.055	-
Pot Cap-1 Maneuver	702	921	-	-	1167	-
Stage 1	877	-	-	-	-	-
Stage 2	742	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	657	921	-	-	1167	-
Mov Cap-2 Maneuver	657	-	-	-	-	-
Stage 1	877	-	-	-	-	-
Stage 2	694	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.3	0	7.54
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	887	1162	-
HCM Lane V/C Ratio	-	-	0.057	0.064	-
HCM Ctrl Dly (s/v)	-	-	9.3	8.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.2	-

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	34	28	5	13	7
Future Vol, veh/h	4	34	28	5	13	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	250	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	48	48	50	50	39	39
Heavy Vehicles, %	78	78	83	83	18	18
Mvmt Flow	8	71	56	10	33	18

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	164	42	51	0	-	0
Stage 1	42	-	-	-	-	-
Stage 2	122	-	-	-	-	-
Critical Hdwy	7.18	6.98	4.93	-	-	-
Critical Hdwy Stg 1	6.18	-	-	-	-	-
Critical Hdwy Stg 2	6.18	-	-	-	-	-
Follow-up Hdwy	4.202	4.002	2.947	-	-	-
Pot Cap-1 Maneuver	678	848	1163	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	745	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	646	848	1163	-	-	-
Mov Cap-2 Maneuver	646	-	-	-	-	-
Stage 1	777	-	-	-	-	-
Stage 2	745	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	9.85	7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1163	-	821	-	-
HCM Lane V/C Ratio	0.048	-	0.096	-	-
HCM Ctrl Dly (s/v)	8.3	-	9.9	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.3	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	79	34	4	3	11
Future Vol, veh/h	25	79	34	4	3	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	77	77	65	65	55	55
Heavy Vehicles, %	9	9	12	12	2	2
Mvmt Flow	32	103	52	6	5	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	58	0	-	0	223	55
Stage 1	-	-	-	-	55	-
Stage 2	-	-	-	-	168	-
Critical Hdwy	4.19	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.281	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1502	-	-	-	765	1011
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1502	-	-	-	749	1011
Mov Cap-2 Maneuver	-	-	-	-	749	-
Stage 1	-	-	-	-	946	-
Stage 2	-	-	-	-	862	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.79	0	8.93
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1502	-	-	-	941
HCM Lane V/C Ratio	0.022	-	-	-	0.027
HCM Ctrl Dly (s/v)	7.4	-	-	-	8.9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	16	4	5	15	4
Future Vol, veh/h	3	16	4	5	15	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	50	50	50	50
Heavy Vehicles, %	2	2	2	2	50	50
Mvmt Flow	6	32	8	10	30	8

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	81	13	0	0	18	0
Stage 1	13	-	-	-	-	-
Stage 2	68	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.6	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.65	-
Pot Cap-1 Maneuver	921	1067	-	-	1336	-
Stage 1	1010	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	900	1067	-	-	1336	-
Mov Cap-2 Maneuver	900	-	-	-	-	-
Stage 1	1010	-	-	-	-	-
Stage 2	933	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	8.6	0	6.12
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1037	1330	-
HCM Lane V/C Ratio	-	-	0.037	0.022	-
HCM Ctrl Dly (s/v)	-	-	8.6	7.8	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	19	19	25	10	3
Future Vol, veh/h	4	19	19	25	10	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	250	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	67	67	78	78	83	83
Heavy Vehicles, %	38	38	3	3	10	10
Mvmt Flow	6	28	24	32	12	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	95	14	16	0	-	0
Stage 1	14	-	-	-	-	-
Stage 2	81	-	-	-	-	-
Critical Hdwy	6.78	6.58	4.13	-	-	-
Critical Hdwy Stg 1	5.78	-	-	-	-	-
Critical Hdwy Stg 2	5.78	-	-	-	-	-
Follow-up Hdwy	3.842	3.642	2.227	-	-	-
Pot Cap-1 Maneuver	824	971	1595	-	-	-
Stage 1	923	-	-	-	-	-
Stage 2	859	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	812	971	1595	-	-	-
Mov Cap-2 Maneuver	812	-	-	-	-	-
Stage 1	909	-	-	-	-	-
Stage 2	859	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	8.98	3.15	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1595	-	939	-	-
HCM Lane V/C Ratio	0.015	-	0.037	-	-
HCM Ctrl Dly (s/v)	7.3	-	9	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection Capacity Worksheets: Year 2045 Background+ Project

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	49	76	5	8	22
Future Vol, veh/h	16	49	76	5	8	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	78	78	47	47
Heavy Vehicles, %	12	12	16	16	12	12
Mvmt Flow	27	82	97	6	17	47

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	104	0	-	0	236	101
Stage 1	-	-	-	-	101	-
Stage 2	-	-	-	-	135	-
Critical Hdwy	4.22	-	-	-	6.52	6.32
Critical Hdwy Stg 1	-	-	-	-	5.52	-
Critical Hdwy Stg 2	-	-	-	-	5.52	-
Follow-up Hdwy	2.308	-	-	-	3.608	3.408
Pot Cap-1 Maneuver	1428	-	-	-	731	928
Stage 1	-	-	-	-	899	-
Stage 2	-	-	-	-	867	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1428	-	-	-	717	928
Mov Cap-2 Maneuver	-	-	-	-	717	-
Stage 1	-	-	-	-	882	-
Stage 2	-	-	-	-	867	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.86	0	9.52
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1428	-	-	-	861
HCM Lane V/C Ratio	0.019	-	-	-	0.074
HCM Ctrl Dly (s/v)	7.6	-	-	-	9.5
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

Intersection	
Int Delay, s/veh	7.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	37	5	3	39	4
Future Vol, veh/h	4	37	5	3	39	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	63	50	50	40	40
Heavy Vehicles, %	63	63	50	50	95	95
Mvmt Flow	6	59	10	6	98	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	218	13	0	0	16	0
Stage 1	13	-	-	-	-	-
Stage 2	205	-	-	-	-	-
Critical Hdwy	7.03	6.83	-	-	5.05	-
Critical Hdwy Stg 1	6.03	-	-	-	-	-
Critical Hdwy Stg 2	6.03	-	-	-	-	-
Follow-up Hdwy	4.067	3.867	-	-	3.055	-
Pot Cap-1 Maneuver	652	915	-	-	1160	-
Stage 1	872	-	-	-	-	-
Stage 2	703	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	597	915	-	-	1160	-
Mov Cap-2 Maneuver	597	-	-	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	644	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.47	0	7.61
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	870	1154	-
HCM Lane V/C Ratio	-	-	0.075	0.084	-
HCM Ctrl Dly (s/v)	-	-	9.5	8.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.3	-

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	45	36	8	19	11
Future Vol, veh/h	6	45	36	8	19	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	250	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	48	48	50	50	39	39
Heavy Vehicles, %	78	78	83	83	18	18
Mvmt Flow	13	94	72	16	49	28

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	223	63	77	0	-	0
Stage 1	63	-	-	-	-	-
Stage 2	160	-	-	-	-	-
Critical Hdwy	7.18	6.98	4.93	-	-	-
Critical Hdwy Stg 1	6.18	-	-	-	-	-
Critical Hdwy Stg 2	6.18	-	-	-	-	-
Follow-up Hdwy	4.202	4.002	2.947	-	-	-
Pot Cap-1 Maneuver	624	825	1134	-	-	-
Stage 1	798	-	-	-	-	-
Stage 2	714	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	584	825	1134	-	-	-
Mov Cap-2 Maneuver	584	-	-	-	-	-
Stage 1	747	-	-	-	-	-
Stage 2	714	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	10.29	6.86	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1134	-	786	-	-
HCM Lane V/C Ratio	0.063	-	0.135	-	-
HCM Ctrl Dly (s/v)	8.4	-	10.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.5	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	37	118	51	6	5	16
Future Vol, veh/h	37	118	51	6	5	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	250	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	77	77	65	65	55	55
Heavy Vehicles, %	9	9	12	12	2	2
Mvmt Flow	48	153	78	9	9	29

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	88	0	-	0	332	83
Stage 1	-	-	-	-	83	-
Stage 2	-	-	-	-	249	-
Critical Hdwy	4.19	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.281	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1465	-	-	-	662	976
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	792	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1465	-	-	-	641	976
Mov Cap-2 Maneuver	-	-	-	-	641	-
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	792	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1.8	0	9.34
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1465	-	-	-	868
HCM Lane V/C Ratio	0.033	-	-	-	0.044
HCM Ctrl Dly (s/v)	7.5	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	5.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	18	6	7	16	4
Future Vol, veh/h	4	18	6	7	16	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	50	50	50	50
Heavy Vehicles, %	2	2	2	2	50	50
Mvmt Flow	8	36	12	14	32	8

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	91	19	0	0	26	0
Stage 1	19	-	-	-	-	-
Stage 2	72	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.6	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.65	-
Pot Cap-1 Maneuver	909	1059	-	-	1327	-
Stage 1	1004	-	-	-	-	-
Stage 2	951	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	887	1059	-	-	1327	-
Mov Cap-2 Maneuver	887	-	-	-	-	-
Stage 1	1004	-	-	-	-	-
Stage 2	928	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	8.68	0	6.22
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1023	1321	-
HCM Lane V/C Ratio	-	-	0.043	0.024	-
HCM Ctrl Dly (s/v)	-	-	8.7	7.8	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	22	22	37	15	5
Future Vol, veh/h	6	22	22	37	15	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	250	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	67	67	78	78	83	83
Heavy Vehicles, %	38	38	3	3	10	10
Mvmt Flow	9	33	28	47	18	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	125	21	24	0	-	0
Stage 1	21	-	-	-	-	-
Stage 2	104	-	-	-	-	-
Critical Hdwy	6.78	6.58	4.13	-	-	-
Critical Hdwy Stg 1	5.78	-	-	-	-	-
Critical Hdwy Stg 2	5.78	-	-	-	-	-
Follow-up Hdwy	3.842	3.642	2.227	-	-	-
Pot Cap-1 Maneuver	791	961	1584	-	-	-
Stage 1	916	-	-	-	-	-
Stage 2	838	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	777	961	1584	-	-	-
Mov Cap-2 Maneuver	777	-	-	-	-	-
Stage 1	900	-	-	-	-	-
Stage 2	838	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	9.12	2.73	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1584	-	915	-	-
HCM Lane V/C Ratio	0.018	-	0.046	-	-
HCM Ctrl Dly (s/v)	7.3	-	9.1	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

DEVELOPMENT AGREEMENT TO BE COORDINATED
BETWEEN COUNTY AND APPLICANT

3-16-2026