PROVO MUNICIPAL COUNCIL

Work Meeting

1:30 PM, Tuesday, July 20, 2021
Hybrid meeting: youtube.com/provocitycouncil or 351 W Center Street, Provo, UT 84601

This meeting will be conducted as a hybrid meeting, with some in-person components as well as continued virtual meeting access. The meeting will be available to the public for live broadcast and on-demand viewing on YouTube and Facebook at: youtube.com/provocitycouncil and facebook.com/provocouncil. If one platform is unavailable, please try the other. If both services are down or unavailable, after a reasonable (but short) time waiting to see if the services resume, the remainder of the meeting will be postponed to the next week, with appropriate public notice given of the rescheduled date. If you do not have access to the Internet, you can join via telephone following the instructions below. The in-person meeting will be held in the **Council Chambers** with limited seating to accommodate social distancing and related public health measures.

To listen to the meeting by phone: July 20 Work Meeting: Dial 346-248-7799. Enter Meeting ID 832 7624 4627 **and press #. When asked for a participant ID, press #.**

Agenda

Roll Call

Prayer

Approval of Minutes

May 11, 2021 Budget Work Meeting
July 6, 2021 Work Meeting

Business

1. A presentation on the Quarterly Report for the 3rd Quarter of Fiscal Year 2021 (21-007)

2. A presentation on the South Utah Valley Animal Shelter's euthanasia techniques (21-084)

3. A Presentation on Technical Findings from the Provo Parks and Recreation Master Plan. (21-046)

4. A presentation regarding the Westside Levee Plan. (21-079)

5. A discussion regarding a Municipal Council Handbook Amendment (21-086)

Administration: Mayor's Update

6. A presentation on Projects Funded by the Innovation Fund (21-085)

Business

7. A discussion regarding the Neighborhood Program. (21-071)

8. A presentation on the Provo River Delta Restoration Project (21-083)

9. A presentation regarding the Development Process: "Context: How design, density, and aesthetics interact" (21-080)

Closed Meeting

The Municipal Council or the Governing Board of the Redevelopment Agency will consider a motion to close the meeting for the purposes of holding a strategy session to discuss pending or reasonably imminent litigation, and/or to discuss the purchase, sale, exchange, or lease of real property, and/or the character, professional competence, or physical or mental health of an individual in conformance with 52-4-204 and 52-4-205 et. seq., Utah Code.

Adjournment

Hybrid Meeting Protocol

For the past year, the Provo City Municipal Council has been meeting without an anchor location, pursuant to Utah's *Open and Public Meetings Act*, and has instead conducted all meetings online. Notwithstanding the ongoing coronavirus pandemic and Utah County's moderate level of coronavirus transmission, **the Municipal Council has determined to hold its meetings at an anchor location AND online**. We invite interested persons to participate:

- in the Council Chambers located at the City Center building; OR
- online by watching the live broadcasts at youtube.com/provocitycouncil and facebook.com/provocouncil.

There will be limited seating available in the Council Chambers and we encourage attendees to maintain appropriate health protocols such as wearing masks and social distancing.
Public comment may be received in person OR online (by calling in or logging onto the Zoom Webinar) which are detailed in meeting notices and agendas, and on the broadcasts. Follow the instructions provided on public notices of each meeting.

If you have a comment regarding items on the agenda, please contact Councilors at council@provo.org or using their contact information listed at: provo.org/government/city-council/meet-the-council

Materials and Agenda: agendas.provo.org
Council meetings are broadcast live and available later on demand at youtube.com/ProvoCityCouncil
To send comments to the Council or weigh in on current issues, visit OpenCityHall.provo.org.

The next Work Meeting will be held on Tuesday, August 3, 2021. The meeting will be conducted **as a hybrid meeting**. Work Meetings generally begin between 12 and 4 PM. Council Meetings begin at 5:30 PM. The start time for additional meetings may vary. All meeting start times are noticed at least 24 hours prior to the meeting.

Notice of Compliance with the Americans with Disabilities Act (ADA)

In compliance with the ADA, individuals needing special accommodations (including auxiliary communicative aides and services) during this meeting are invited to notify the Provo Council Office at 351 W. Center, Provo, Utah 84601, phone: (801) 852-6120 or email evanderwerken@provo.org at least three working days prior to the meeting. Council meetings are broadcast live and available for on demand viewing at youtube.com/ProvoCityCouncil.

Notice of Telephonic Communications

One or more Council members may participate by telephone or Internet communication in this meeting. Telephone or Internet communications will be amplified as needed so all Council members and others attending the meeting will be able to hear the person(s) participating electronically as well as those participating in person. The meeting will be conducted using the same procedures applicable to regular Municipal Council meetings.

Notice of Compliance with Public Noticing Regulations

This meeting will be conducted as a hybrid meeting. The public can attend in person at 351 W. Center Street, Provo, UT 84601. The meeting will also be available to view on YouTube at youtube.com/ProvoCityCouncil. This meeting was noticed in compliance with Utah Code 52-4-207(4), which supersedes some requirements listed in Utah Code 52-4-202 and Provo City Code 14.02.010. Agendas and minutes are accessible through the Provo City website at agendas.provo.org. Council meeting agendas are available through the Utah Public Meeting Notice website at utah.gov/pmn, which also offers email subscriptions to notices.

Pending minutes – awaiting approval

Please note: these minutes have been prepared with a timestamp linking the agenda items to the video discussion. Electronic version of minutes will allow citizens to view discussion held during council meeting.

PROVO MUNICIPAL COUNCIL
Work Meeting Minutes

2:00 PM, Tuesday, May 11, 2021
Hybrid meeting: youtube.com/provocitycouncil or Council Chambers, 351 W Center Street, Provo, UT 84601

Agenda (0:00:00)

Roll Call

The following elected officials participated:

Council Chair David Sewell, conducting
Council Vice-chair David Shipley
Councilor George Handley
Councilor Bill Fillmore
Councilor Shannon Ellsworth
Councilor David Harding
Councilor Travis Hoban
Mayor Michelle Kaufusi

Prayer

Councilor Shannon Ellsworth offered the prayer.

Business

1. A presentation regarding Council budget priorities in regard to FY 22 proposed budget. (21-015) (0:14:20)

Cliff Strachan, Council Executive Director, presented. He reviewed elements of the tentative FY2022 budget as they related to the Council's stated priorities. He noted that the greatest challenge was simply in the limited funds available. Mr. Strachan and others responded to questions from Councilors during the presentation.

Councilor David Harding asked about the increase for benefits. John Borget, Administrative Services Director, explained that the Milliman index determines the increase for medical insurance rates. This was reflected in the budget for the calendar year (or plan year) effective in January 2022. Mr. Borget also explained that sick leave buyout, travel, and training budgets had been restored in the budget going forward. He noted that the City did give merit increases last year. Councilor David Sewell asked for clarification regarding sick leave buyout; Mr. Borget explained that the City "buys" back half of unused yearly sick leave accrual from employees. Councilors also asked how public safety staffing, as well as a long-term plan, had been addressed in the budget. Several Councilors expressed that additional guidance from the Police Department

would be appreciated, particularly regarding the timing for police officers at the airport. Mr. Harding asked about the transition time reflected in the Police Department staffing budget. Wayne Parker, CAO, explained that this reflected a net increase of one full-time equivalent and a second officer who was being funded by reallocating funds from two civilian positions to one office position. Mr. Parker explained that the Police Department can sometimes exceed the number of permitted positions in their budget due to the timing of some candidates in the Police Academy. Mr. Parker also noted that the amount in the budget included salary and benefits, as well as equipment and vehicle costs. Mr. Parker noted that over time, the Police Department has demonstrated consistent savings in the personnel accounts, so some funds have been proactively applied to operational needs elsewhere in the department without impacting the overall budget.

Mr. Parker addressed several additional questions from Mr. Harding; he explained more details regarding the budget items related to technological infrastructure and the future move to a new building. Councilor Bill Fillmore shared concerns about cybersecurity. Mr. Parker explained that such questions would be better deferred to a closed meeting. Mr. Borget added that they have a fulltime cybersecurity analyst as well as other staff members who are experts in the field.

Chief Rich Ferguson spoke to several of the earlier questions. The Police Department has asked for 5 officers in the upcoming budget year, who would comprise a dedicated full-time police team at the Provo Airport. Expansion of airport will be launched in about 18 months. It takes roughly a year to identify, do a background check, and train police officer. The officers he has in mind to go to new airport would not be brand new rookie officers; they would be veteran officers in Provo's police force, but he would need to have officers to replace them—by anticipating these needs early, they would be situated to adequately meet the future needs. Chief Ferguson responded to a follow-up question from Councilor George Handley regarding the timing of the funding for these officers. ***Presentation only.***

2. A presentation on FY 22 Budget All Fund Revenue Forecast. (21-015) (0:57:14)

John Magness, Policy Analyst, presented. He shared revenue projections and comparisons staff had used for the forecast and he reviewed each revenue category. He invited questions and discussion from Councilors during and afterwards. Councilor David Sewell thanked Mr. Magness for his analysis. Mr. Sewell restated his takeaways from the presentation as a means of confirming that he understood the presentation and its conclusions. Mr. Magness offered further clarification of the methods used for analysis, comparing year-over-year growth as well as the difference between projected and actual revenues. Councilor David Shipley also thanked Mr. Magness for this helpful presentation. Mr. Shipley suggested it would be helpful to see trends for different departments over the last four years, in order to get a better sense of where the revenue growth was being programmed. He also thought it would be a helpful exercise in order to more clearly communicate to the public how tax revenues were being used. ***Presentation only.***

3. A presentation regarding COVID-19 full-time equivalent (FTE) cuts and restoration for FY22 (21-015) (1:23:16)

John Magness, Policy Analyst, presented. He reviewed the FTEs which had been restored in budget, noting specific FTEs for each department. In several cases, Mr. Magness also

highlighted adjustments being made to reconcile formula errors. Councilor David Harding asked for clarification about the formula errors. David Mortensen, Budget Officer, responded to this question. He explained that generally these formula errors were just in the formulas that calculate the number of FTEs but did not impact the funds budgeted to a department. Mr. Harding shared follow-up comments and feedback on this data and how it was presented in the budget. Mr. Mortensen offered additional clarification and noted that they could look at adding a description as to what changes were involved with the FTE formula error versus which changes resulted in impacts to the budget amount. ***Presentation only.***

4. A presentation from the Community and Neighborhood Services Department regarding their FY22 tentative proposed budget. (21-015) (1:34:44)

Gary McGinn, Community and Neighborhood Services Director, and Sandy Bussio, Parking Enforcement Supervisor, presented. Mr. McGinn elaborated on the supplemental request for additional parking enforcement officers and administrative support. He also wanted to outline their revenue projections with two additional enforcement officers in place. Ms. Bussio shared data based on the current staffing level, including personnel and equipment costs. She also reviewed the revenue based on standard ticketing and citations in a typical year. Ms. Bussio also shared details about the training for enforcement officers and how they intended to utilize additional officers to be more responsive to requests coming through customer service. Ms. Bussio also highlighted details for the various parking permit areas throughout the city. Mr. McGinn noted that they were at capacity right now and without additional staffing, could not support extensions to the permit areas and increased customer service requests. The intent was that the revenue resulting from the additional capacity of additional enforcement staff would provide the necessary budget to fund those added positions.

Councilor David Harding asked several questions. He wondered where they were at in the process of hiring a parking coordinator. Mr. McGinn hoped they would open the posting the following week. He noted that parking enforcement needs would still exist regardless of having a parking coordinator. Mr. Harding also asked if this supplemental request had been funded as part of the tentative budget. Wayne Parker, CAO, indicated that it was not funded at this time. Mr. Harding wondered whether it would be possible to pursue creating an enterprise fund to encapsulate all parking management activities, as revenues and expenditures would be easily identified within the fund. Mr. Parker issued a caution regarding the revenue projection; he agreed with Mr. McGinn and Ms. Bussio on their strategy, but that doubling staff was not a guarantee that revenue would necessarily double. Mr. Parker suggested other factors that could impact the projection. Councilor Shannon Ellsworth asked for clarification on the projection; Ms. Bussio indicated the numbers were based on current revenue with the current staffing. Mr. Parker also noted that some expenses were first-year expenses but not ongoing, so that would likely help them to reach more of a break-even scenario. Mr. Harding shared additional comments and noted his appreciation for the discussion. ***Presentation only.***

5. A presentation from Public Works regarding their FY 22 tentative proposed budget (21-015) (2:08:02)

Dave Decker, Public Works Director, presented. Mr. Decker shared highlights of some of the

major Public Works projects which were currently in progress or in the near future. Where applicable, he identified the funding sources or noted which projects were as yet unfunded. Major projects and policy items included:

- Culinary water treatment plant (including grant-funded portions)
- Aquifer Storage and Recovery (ASR)
- Recommendation for tiered water rates
- Highlights/overview of west side sewer projects through 2025
- Provo Airport terminal construction
- B&C Road funds
    - Mr. Decker shared a list of unfunded projects in the qualifying categories. 1450 East was not fully funded but there were adequate funds to install one traffic circle. There were also unfunded road projects associated with access to the future Regional Sports Park.
- With the recent shortening of the Parks and Recreation timeline for the Canyon Road Park, this introduces some issues for Public Works; they need to advance some capital projects that will serve that park and the surrounding area with necessary infrastructure.

Councilor David Shipley asked about the tiered water rates and how this system could further motivate and incentivize conservation among Provo residents. Mr. Decker shared more details from Bowen Collins, the city's consultant on developing the tiered rate structure, on the process by which they reached the recommended tiered rates. Mr. Decker explained that in order to make the change revenue-neutral, they had to decrease the number of tiers from the original recommendation. Mr. Shipley thanked Mr. Decker for the explanation and while he was curious about the other options, he indicated he trusted Mr. Decker's assessment.

Mr. Shipley asked about the City's new wastewater treatment technology and whether it could serve as a backup system for potable water if necessary. Mr. Decker explained that membrane bio-reactor systems were the most advanced of their kind and were common in California, Arizona, Texas, and elsewhere. Reverse osmosis also takes out some of additional minerals in the effluent. He noted this process is added at end of treatment plants in locations where the resulting effluent is returned to the culinary water system. Mr. Decker explained that Provo does not currently have this reverse osmosis process added at the end of our treatment plant, however, Provo's resulting effluent could be used for secondary water sources. Mr. Shipley was interested in learning the cost to add reverse osmosis treatment as a contingency plan. Mr. Decker indicated that he could check the costs of what that might be for Provo's system. Mr. Shipley also asked whether the potential of receiving funds from the American Rescue Plan Act jeopardized any of the City's opportunities for grant funding on ASR and other projects. Mr. Decker did not believe it hindered the City's ability to secure funds from other sources.

Councilor David Harding suggested implementing a small increase for the utility rates to compensate for the two-month delay in implementation. He worried if the City was hampering their future ability to have necessary funding by shorting the initial revenues with the two-month delay. He agreed that offsetting rate changes to occur outside of peak usage months made sense.

Councilor Shannon Ellsworth did not realize that when the Council approved the Canyon Road Park that there were associated costs and infrastructure which had not been considered. There are

also obviously related infrastructure costs associated with the Regional Sports Park. She wondered whether there were other projects the Council has approved which had significant infrastructure needs or impacts. Mr. Decker explained that those two projects were those in the immediate fiscal years that had a specific impact. He noted that there could be infrastructure needs for a west side grocery store depending on the location. Ms. Ellsworth wished the Council had had this information when they were approving allocations of the Legacy CIP funds.

Mr. Harding thought the Council should issue a policy statement about sidewalks and prioritization of sidewalks as they relate to safe routes to school. He also wondered if there was a policy or formula in place for determining priority of different street projects; rather than having a few resident complaints driving the priorities, perhaps there was a way for such comments to factor into a prioritization formula that the Council could then support. Councilor George Handley said the list of unfunded projects was very helpful. He invited any suggestions from Mr. Decker about how to prioritize funding for these projects. Mr. Decker advised against the Council diving into the formula for streets maintenance, as he felt it would be difficult to understand and use the formula without a complete technical background and understanding of the process. Mr. Decker shared more insight into how some of their funding sources work as well, noting that qualifying projects was a factor in how certain funds are used. Whether projects have regional significance is another factor. ***Presentation only.***

6. A discussion regarding the tentative budget for FY22 (21-015) (2:53:03)

Cliff Strachan, Council Executive Director, presented. He asked what the Council wanted to discuss in this meeting as well as upcoming meetings. Mr. Strachan indicated that there would be future discussions on the American Rescue Plan Act funds, some of which could be used for infrastructure, and therefore possibly freeing up General Fund dollars for other uses. Mr. Strachan also noted that the Carryovers Committee met yesterday and have had productive discussions with the City Administration regarding improvements to the carryovers process.

Councilors shared comments, questions, and feedback, including:

- Councilors were interested in discussing ARP funds and the remaining balance of the Legacy CIP fund. Council Chair David Sewell indicated that Council Leadership would program discussions on these topics when they had more guidance and certainty on how ARP funds could be used.
- Councilor George Handley wanted to ensure that ARP money helped populations who had been the most hurt by the pandemic. He was interested in collaborating with leaders in the Hispanic community, particularly on education about vaccination.
- Mr. Handley noted the Foothills Protection Committee was preparing to bring an item to the Council regarding specialized plans for sustainability, foothills and canyons, gateways, and a river and lake plan.
- Wayne Parker, CAO, thought some additional discussions on revenue projections might be helpful for the Administration to share more details on how they forecast.
- Mr. Parker responded to a question from Councilor David Harding regarding positions in Community and Neighborhood Services, noting that several positions will be moved from CDBG to the General Fund.

- Mr. Harding thought the long-range planning items were a great use of one-time funds. Mr. Harding also supported an outcome-oriented discussion of the FY20 budget to inform the Council's plans for the FY22 budget.
- Mr. Sewell asked about the new IT infrastructure and phone system; Mr. Parker clarified this was a one-time expense and would be coming from fund balance.
- Mr. Sewell was interested in an assessment on the parking enforcement revenue projection from the Administration. Mr. Parker indicated they could look at this.
- Councilor Bill Fillmore was interested in discussing funding additional police officers.
- Mr. Handley asked Mr. Decker about the impacts of the current drought to the City's aquifer storage and conservation efforts. Mr. Decker did not think the City should take an aggressive approach to pushing conservation at this time; he thought it was better to take an education and self-involvement approach to help residents learn more and manage their own resources. He indicated that overall, Provo does quite well with water conservation and using resources carefully.
- David Mortensen, Budget Officer, clarified details about the code enforcement officers and how these FTEs were accounted for in the budget.
- Councilor Travis Hoban indicated that others had covered the topics he is interested in.

Mr. Strachan indicated that the Council would tentatively adopt the tentative budget on May 18 and then hold formal budget hearings on June 1 and 15. ***Presentation only.***

Adjournment

Adjourned by unanimous consent.

Pending minutes – awaiting approval

Please Note – These minutes have been prepared with a timestamp linking the agenda items to the video discussion. Electronic version of minutes will allow citizens to view discussion held during council meeting.

PROVO MUNICIPAL COUNCIL
Work Meeting Minutes

1:30 PM, Tuesday, July 06, 2021
Hybrid meeting: youtube.com/provocitycouncil or 351 W Center Street, Provo, UT 84601

Please note that due to technical issues, there is no audio for about the first 10 minutes of the meeting (in the YouTube video, the audio begins at 0:16:36).

Agenda (0:00:00)

Roll Call

The following elected officials participated:

Council Vice-chair David Shipley, conducting
Council Chair David Sewell
Councilor David Harding
Councilor George Handley
Councilor Shannon Ellsworth
Councilor Travis Hoban (via Zoom webinar)
Councilor Bill Fillmore, arrived 1:36 PM

Excused: Mayor Michelle Kaufusi

Prayer

Michael Sanders, Council Intern, offered the prayer.

Approval of Minutes

April 20, 2021 Work Meeting
May 4, 2021 Work Meeting
June 1, 2021 Work Meeting
June 15, 2021 Work Meeting
Approved by unanimous consent.

Business

1. A presentation regarding the Neighborhood Program. (21-071) (0:13:26)

Karen Tapahe, Community Relations Coordinator, presented. Ms. Tapahe manages the neighborhood program and does various communications work in her role. Ms. Tapahe shared the research and materials presented to the Council, including the results of a survey about the

neighborhood program, as well as a literature review and report written by John Magness, Policy Analyst. Mr. Magness reviewed the highlights from the literature on neighborhood councils (NC) or neighborhood programs. He reviewed the main issues involved with NCs and how that has shown up in various contexts in Provo's neighborhood program. Ms. Tapahe also reviewed the organizational structure for the City's neighborhood program as outlined in city code. She shared several graphics illustrating the process and setup of the neighborhood program and land use review process, noting how these interact.

Mr. Magness reviewed responses received through the Open City Hall survey. The results generally skewed toward long-term residents. Almost half of respondents are unaware about neighborhood meetings happening. The open-ended questions revealed two distinct groups—those who are active within the neighborhood and were happy with it as it is and would like small incremental changes; the other group are those who do not participate and would like more structural changes. Both of these groups want more Council participation. The latter group wants better communication from the city and a set time and place for meetings. Then there is a small third group that feels disenfranchised by the program.

Councilors asked questions throughout the presentation and Mr. Magness responded in turn highlighting information about the survey or how the questions had been structured. He briefly highlighted concerns raised in the open-ended section of the survey. Councilor David Shipley asked how many neighborhoods were currently functioning. Ms. Tapahe said that about a third of neighborhoods have some sort of regular meeting or activity. As Councilor David Harding pointed out, some may not have a specific reason (such as a land use application) to do something. Ms. Tapahe reviewed the section of the OCH survey on neighborhood chairs. She highlighted the different challenges that neighborhood chairs have identified from their experience in their volunteer roles.

Ms. Tapahe shared some of the possible recommendations which had been shared in the survey:

- Group neighborhoods
- Establish better meeting location options
- Hold meetings on zone change applications online
- Collect feedback online
- Council Member Liaisons
- Improve training

They hoped the Council could discuss and direct such things as the goals of the program, the organization and structure, staff support, methods of communication, flexible versus specific guidelines, and whether to refer the issue to a committee for recommendations.

Councilor Shannon Ellsworth asked what input and feedback was received from City staff. Wayne Parker, CAO, shared insight from his conversations with department directors. The biggest source of frustration from staff centers around the role of neighborhoods with land use applications. Neighborhood feedback is important, but it often feels to staff and the Planning Commission (who represent a citywide perspective) as though the neighborhood's feedback is prioritized over a broad perspective. Mr. Parker has received great feedback about doing online neighborhood meetings, which has allowed for broader feedback from neighborhood residents than a traditional in-person meeting. He noted that another pain point was a lack of clarity

regarding how departments should interface with neighborhoods on things like CIP projects. In general, the City Administration appreciates the opportunity to work with neighborhoods, but there are some systemic weaknesses that could be better addressed to better connect the administrative functions of the city with the neighborhood program.

Councilor George Handley suggested that the best communication possible was an important goal of the neighborhood program, as well as helping people get involved locally.

Motion: George Handley moved to refer this issue to and get recommendations from the Neighborhood Advisory Board (NAB). Seconded by David Sewell.

Mr. Handley explained the idea with his motion—he hoped that neighborhood stakeholders could be part of the review process so they had buy-in. Ms. Ellsworth explained that in recent months, the NAB discussed a code of ethics for the neighborhood program and they received a lot of pushback from the neighborhood chairs on this issue. She felt that the Council first needed to determine the scope of review. Another alternative is to approach the BYU MPA program to see if they would do a class project to evaluate the program or to determine what are the best ways to communicate and engage with neighborhood groups. Councilors discussed the NAB.

Councilor Bill Fillmore asked whether there were any successful neighborhood councils where neighborhood chairs and area reps were appointed as opposed to elected. Mr. Magness explained that in the vast majority of cases, the Council appoints members of neighborhood councils in order to ensure there is a necessary leadership skillset and buy-in.

Brian Jones, City Attorney, expressed some concerns with having the NAB review the program. He felt there was a possible conflict of interest with having neighborhood chairs form the review body, as they may not approach things the same way the Council would wish. He suggested the Council first determine what they saw as the main issues. Cliff Strachan, Council Executive Director, shared comments with common issues with neighborhoods. The challenge is with how to get the best information back. Council Vice-chair David Shipley suggested the Council figure out whether to move forward with the current motion, form an ad hoc committee, or review the issues as a body. Councilor David Harding thought that the discussion to this point has been on how the program serves the Council, but he thought that a better question was how the program could serve residents as they engaged in government to solve their own issues.

Substitute motion: Shannon Ellsworth moved to have three members of Council, with her as chair, David Harding as vice-chair, and Bill Fillmore as a member, create an ad hoc committee to address concerns that were presented today, to work with the Administration, current and previous neighborhood chairs, Bill Hulterstrom at United Way, each at one or more meetings, to review concerns, perhaps refer a study of the issue to the BYU MPA program, and to refer this to the ad hoc committee. Seconded by David Shipley.

Second substitute motion: David Harding moved to continue this presentation and discussion. Seconded by David Sewell.

Mr. Handley supported continuing the item; he hoped to get more clarity on the scope and issues to help determine whether this should be referred to the Neighborhood Advisory Board or if the Council should create an ad hoc committee. Mr. Harding hoped the item could come back as soon as possible and allow for extensive discussion. Mr. Handley clarified that he saw the discussion as having a goal of determining the objectives that would be referred to committee.

Vote: Approved 6:1, with Shannon Ellsworth opposed.

2. A resolution approving Veracity Networks LLC's assignment of franchise agreement to Firstdigital Communications, LLC. (21-057) (1:29:54)

Marcus Draper, Assistant City Attorney, presented. Mr. Draper noted that Veracity and Firstdigital both have active franchise agreements with the City. Under the terms of those agreements and the Provo City Code, any transfer of rights requires the Council's consent. This does not change the terms of franchise agreements. ***Presentation only. This item was already scheduled for the Council Meeting on July 6, 2021.***

3. A presentation on Envision Utah's Valley Visioning work. (21-080) (1:31:29)

Curtis Blair, President and CEO of Utah Chamber of Commerce, and Ryan Beck, Envision Utah, presented. Mr. Blair reviewed the process for the Valley Visioning initiative, which involved many organizations throughout Utah County. The Valley Visioning effort is intended to address the future of growth in Utah County. Mr. Beck continued presenting, noting that the success of Utah County is going to determine the success of the state. He shared results from their listening sessions conducted over the course of about half a year. The group then presented respondents with specific scenarios highlighting different patterns of growth to get feedback. Options included current conditions, organized centers, westward growth, southern growth, and urban infill. They conducted random sample surveys as well as public feedback surveys and results were fairly consistent between them. There was a lot of support for organized centers, westward growth, and urban infill. Many people acknowledged the importance of agricultural and open space land uses in south part of the County. For housing scenarios, the results showed preference for more of a mix of single-family, townhomes, and apartments/condos—this was driven by affordability and a desire to be located close to urban centers and services. Cities and developers need to develop more multifamily housing to allow for this to happen. The vision for the future included wise water management, convenient transportation choices, clear air, a well-educated population, housing options, local agriculture, open space, and recreation opportunities.

Mr. Beck highlighted important strategies for accomplishing this vision:

- Develop network of walkable mixed-use centers
- Variety of market-based neighborhood and housing types
- Well-maintained highway, transit, and active transportation infrastructure
- World-class education system with high-quality educators
- Efficiently use resources and minimize pollution

Mr. Beck also shared their 2050 vision map, which identified different types of centers: metro, city, urban, neighborhood, and industrial. Mr. Curtis explained that the Utah Valley Chamber

recently welcomed former Governor Gary Herbert as their executive chair. He would be speaking at their Growth and Prosperity Summit in October.

Councilor George Handley thought this visioning effort had a lot to recommend it and he was glad to see it come to fruition. Mr. Handley had expressed concerns early on that the report makes no mention of carbon emissions or climate change. While the goals are laudable and many help with climate change, there isn't anything that addresses it outright. He noted there are also areas in which clean air and climate don't overlap—there seemed to be a determined commitment to not use the word carbon and he was concerned that this report ignored critical issues for the future of Utah Valley by ignoring these concerns. Mr. Beck said Mr. Handley's points were well-taken. They had avoided using the words carbon or climate change, as those sometimes evoke negative feelings from people. Mr. Curtis said the Chamber has recently been invited to look at carbon emissions in the area and they were collaborating with the Utah Valley Clean Air Task Force. Mr. Curtis also noted that the survey results showed the issues which were top-of-mind with citizens; there is so much more that will need to be addressed to manage growth appropriately. He noted that housing and water might perhaps be more important if the survey were conducted today.

Cliff Strachan, Council Executive Director, asked about NIMBYism ("Not In My Back Yard") with regards to the survey. Mr. Curtis explained that one of the Chamber's most important roles has been to help debunk and dispel the myths of growth. The more guardrails we put around growth, the more difficult it becomes for the average middle-class community member to level up. Limiting growth is akin to limiting prosperity but anti-growth sentiments still persist. Mr. Curtis indicated that they were conducting growth research in conjunction with the Kem C. Gardner Institute. They also intend to employ best practices for growth that can help avoid some of the issues that often beset communities as they grow. Without data and without context, we do the same things and expect different results, so they hope to chart a different path forward.

Councilor David Harding thanked Mr. Blair and Mr. Beck for their presentation, which represented a culmination of years of work. Mr. Harding hoped that neighborhood centers could also be identified. He also suggested that in renderings of the roadway across the lake, the imagery should display only transit, as we really need to implement transit infrastructure to reduce reliance on cars, which will be critical to addressing the stated goals. Council Vice-chair David Shipley thanked Mr. Blair and Mr. Beck for their presentation. ***Presentation only.***

4. An ordinance updating Provo City Code to remove gendered language and to make other minor corrections for consistency and stylistic purposes. (21-073) (2:06:11)

Brian Jones, City Attorney, presented. The memo provided describes this issue, noting that the State code and constitution were recently updated in like manner. Several Councilors had expressed a wish to similarly update the city code so gendered references were removed. Elizabeth VanDerwerken, Council Executive Assistant, prepared this ordinance proposal after a thorough review of the code. The portion addressing Titles 14-15 were sent to the Planning Commission first, so that section would come to the Council separately at a future time. Councilor Shannon Ellsworth thanked Elizabeth for taking on this project. ***Presentation only. This item was already scheduled for the Council Meeting on July 6, 2021.***

5. A Resolution Appropriating $1,250,175 in the Legacy CIP Fund for the Acquisition of Land near Slate Canyon (21-058) (2:07:30)

Tara Riddle, Property Manager, presented. The subject parcel is two parcels with combined acreage of 29 acres. In recent years, the City has acquired properties around Slate Canyon and Rock Canyon for parks and trails. There was interest around this property due to its proximity to the Bonneville Shoreline Trail (BST). Normally discussions about property purchases and sales are conducted with the Council in Closed Meetings; broad public knowledge of the city's interest could result in speculation which would drive up the price. Ms. Riddle clarified the process by which this property was explored for City acquisition. This was the subject of a development proposal several years ago; it was determined as not feasible since the property was outside the water service zone. At the time, the developer decided that the cost of the needed improvements in the area could not be recouped with the requisite fewer homes. The land was then deeded to the current property owners. The City has had issues with this property over the years, including transient camps, trash, and other nuisance issues. This has increased the City's interest in the property so they could control the activity happening on the property. Images of the property show a cluster of trails running through property as well as the existing development to the west. Among other reasons, the property is ideal for acquisition because it provides clear routing of the BST that maintains the elevation and follows a comfortable contour; the property also provides an opportunity to restore the disrupted hillside through revegetation and maintaining open space.

The appraised value of the property as determined by a City appraisal in November 2020 was $930,000. In April 2021, the property owner's appraisal was for $2,270,000. The property owner's appraisal was problematic because the comparable properties were flat farmland in Mapleton and therefore not really comparable. The City worked with the seller to negotiate a fair price of $1,250,000. The City has made several assurances to the developer, including that the property would be zoned as Open Space Parks and Recreation, and that it is located within the Critical Hillside Overlay Zone. In the future, if the City decides not to use this property for trails or a park, the seller would have the right of first refusal to purchase the property back while following the process outlined in City Code for the disposal of property. This request is for the Council to adopt the resolution appropriating the necessary funds from the Legacy CIP fund.

Councilor Shannon Ellsworth expressed her appreciation to Ms. Riddle for her efforts in this process. Councilor Bill Fillmore also thanked Ms. Riddle. He asked about Parks and Recreation's intentions for this property. Doug Robins, Assistant Parks and Recreation Director, said that their priority first and foremost was to align the BST. There would likely be space for sports courts, off-leash dog park area, and any other park amenities they would want to see. The property could also incorporate natural areas and the hillside. Mr. Robins indicated that they would want to start the committee park development process in that area before sharing more specifics, but that is an overview of their broad intentions at this time. Councilor David Harding hoped this would be part of the level of service calculation for parks in the City. Councilor George Handley asked whether this property would be part of the revised master plan for Slate Canyon. Mr. Robins indicated yes. Mr. Handley expressed that the City's investment in Slate Canyon was exciting to see. He thanked Ms. Riddle for her negotiations and the conversations

needed to make this happen. ***Presentation only. This item was already scheduled for the Council Meeting on July 6, 2021.***

6. ***CONTINUED* A presentation regarding a new Golf Cart Lease for the Golf Course. (21-081)**

7. A discussion regarding the Council's priorities for future appropriations from the Legacy CIP Fund. (21-037) (2:26:34)

Cliff Strachan, Council Executive Director, presented. Mr. Strachan shared background on the Legacy CIP, which was initially comprised of almost $8 million. The Foothills Protection Committee recently gave guidance on some of the spending of the funds of the Legacy CIP. George Handley, Foothills Protection Committee Chair, clarified the nature of the committee's request. Mr. Strachan highlighted several potential uses of Legacy CIP funds, including some of the unfunded supplemental requests in the City budget. Requests had been received from several city departments. Mr. Strachan outlined these requests, including sidewalk infrastructure on several sections of Canyon Road, 600 South sidewalk, 2230 N at 250 East improvements, Center Street improvements, and Slate Canyon Drive improvements were from Public Works. Parks and Recreation has identified Bonneville Shoreline Trail improvements and development and updates to the group event pavilion at Timpanogos Golf Course as unfunded supplemental requests.

Wayne Parker, CAO, shared details on the Fire Department's request for the ProQA medical interrogation system, which allowed dispatchers to utilize an interrogation software for interacting with residents during a medical emergency. The Fire Department also requested an upgraded fire alerting system, which would allow all fire stations to have alerts directly to dispatch services much more quickly. Councilor David Shipley asked about the software referred to in the Fire Master Plan—Mr. Parker indicated that ProQA had the requested functionality.

Councilor George Handley asked whether the Administration had any sense of the type of guidance cities would receive about using ARPA funds for infrastructure. Kelsey Zarbock, Accountant, explained that the Treasury Department was accepting comments on their guidelines until July 16 this month, so it was still somewhat subject to change. For infrastructure, water and wastewater projects were more likely to be eligible, with other projects being up in the air as to whether or not they would be eligible for ARPA fund use. Isaac Paxman, Deputy Mayor, shared his comments on the Administration's approach to the uncertainty with ARPA.

Councilor Shannon Ellsworth said that her understanding was that the Administration had decided on the use of what they designated as the Legacy CIP; the Council did not have a specific policy statement or determination about legacy projects. Mr. Strachan cautioned the Council against sing Legacy CIP funds for ongoing expenses.

Councilor Bill Fillmore asked for more information about qualifying infrastructure projects. Mr. Strachan explained that most of the projects on this list of supplemental requests would not qualify according to staff's reading of ARPA. Mr. Parker noted that water, wastewater, and stormwater projects were pretty clear permitted uses, but they were waiting for further and final guidance from the Treasury department. In response to Mr. Handley's earlier comment about

populations disproportionately impacted by the pandemic, he noted that some cities looked at this as homeless individuals or qualified census districts, but it was better to wait for additional clarity on this. In general, their sense has been that the City is better off letting the guidance from the federal government coalesce before making final decisions about ARPA funds.

Councilor David Harding shared comments and indicated support for the long-range planning items. He thought the Council needed to be careful and perhaps wait until they knew more about the uses for ARPA funds. Mr. Harding also thought that redoing Center Street was an amenity that benefitted the entire city and constituted a legacy project. Mr. Shipley also noted that the additional long-range planning would likely result in proposals of other projects in the City.

Mr. Strachan asked the Council if they had questions about the projects for these directors and their staff. Mr. Strachan outlined some possible actions the Council could take. Mr. Fillmore asked Dave Decker, Public Works Director, how he would prioritize the projects. Mr. Decker noted that pedestrian safety, particularly for areas that serve younger residents or children, made some of the sidewalk items more of a priority.

Ms. Ellsworth hoped that the Council could allocate funds for planning projects as soon as possible. Several other Councilors voiced consensus for this $300,000 allocation. Ms. Ellsworth also listed her priorities including the Bonneville Shoreline Trail, Slate Canyon Drive safety, and sidewalk improvements. Mr. Handley wondered if the foothills and canyons plan would address the BST. Mr. Fillmore supported the long-range planning, after which public safety was his priority. Councilor David Sewell was also supportive of the $300,000 for planning, after which sidewalk safety for children's school routes was critical.

Motion: David Harding moved to request that staff bring forward an appropriation of $300,000 for the long-range planning initiatives. Seconded by Shannon Ellsworth.
Vote: Approved 7:0.

Council Vice-Chair David Shipley thanked City employees for all their support of the Freedom Festival—the event was clean, organized, and effective, and the support of city staff to pull off this scale and size of event was awesome.

Closed Meeting

The Municipal Council or the Governing Board of the Redevelopment Agency will consider a motion to close the meeting for the purposes of holding a strategy session to discuss pending or reasonably imminent litigation, and/or to discuss the purchase, sale, exchange, or lease of real property, and/or the character, professional competence, or physical or mental health of an individual in conformance with 52-4-204 and 52-4-205 et. seq., Utah Code.

Motion: David Sewell moved to close the meeting. Seconded by George Handley.
Vote: Approved 6:0, with Travis Hoban excused.

Adjournment

Adjourned by unanimous consent.

PROVO MUNICIPAL COUNCIL STAFF REPORT

Submitter: JOHNB
Department: Administrative Services
Requested Meeting Date: 07-20-2021

SUBJECT: A presentation on the Quarterly Report for the 3rd Quarter of Fiscal Year 2021 (21-007)

RECOMMENDATION: None

BACKGROUND: Provide a high level overview of revenues and expenses in the City for the 3rd quarter of fiscal 2021.

FISCAL IMPACT: None

PRESENTER'S NAME: John Borget, Administrative Services Director

REQUESTED DURATION OF PRESENTATION: 10 minutes

COMPATIBILITY WITH GENERAL PLAN POLICIES, GOALS, AND OBJECTIVES:

CITYVIEW OR ISSUE FILE NUMBER: 21-007

PROVO MUNICIPAL COUNCIL STAFF REPORT

Submitter: MISANDERS
Department: Council
Requested Meeting Date: 07-20-2021

SUBJECT: A presentation on the South Utah Valley Animal Shelter's euthanasia techniques (21-084)

RECOMMENDATION: Presentation only

BACKGROUND: The Utah Animal Rights Coalition (UARC) has been attending city council meetings in Utah County over the use of carbon monoxide to euthanize animals. Since Provo is a member of the South Utah Valley Animal Shelter (SUVAS) which utilizes a carbon monoxide (CO) chamber, it has been suggested by Provo's Animal Control Division that the Council hear a presentation on SUVAS' use of a CO chamber, how it works, and why it is used.

At the direction of the Council Chair, staff has also prepared a memorandum (on the differences between carbon monoxide and intravenous injection euthanasia) and will be discuss findings.

FISCAL IMPACT: none

PRESENTER'S NAME: Captain Brian Wolken, Provo Police Department; Kierstan Munford, SUVAS Director; Michael Sanders, Council Intern

REQUESTED DURATION OF PRESENTATION: 30 minutes

COMPATIBILITY WITH GENERAL PLAN POLICIES, GOALS, AND OBJECTIVES:

CITYVIEW OR ISSUE FILE NUMBER: 21-084

PROVO CITY MUNICIPAL COUNCIL

Staff Memorandum

Michael Sanders, Council Intern

Animal Euthanasia: Carbon Monoxide and Injection

July 13, 2021

SUMMARY

Euthanasia is used to end the suffering of an animal that cannot be revived by medical means or to put down an animal that is too aggressive to be placed back into the community. The method chosen to euthanize the animal must be balanced between the safety of the workers with what is most humane for the animal.

In the unfortunate circumstance that an animal needs to be euthanized there are a variety of methods currently employed by animal shelters and veterinary clinics in the United States. These methods include the following:

- Non-inhaled agents (such as barbiturates and barbituric acid derivatives) administered intravenously or intraperitoneally (i.e., through the body cavity)
- Inhaled agents as anesthetics (such as carbon monoxide or carbon dioxide)
- Physical methods such as a penetrating captive bolt, gunshot, or electrocution

All the above methods are either approved or approved with conditions by the American Veterinary Medical Association for the euthanasia of companion animals.[i] Though all are approved, many are not recommended for routine euthanasia, including carbon monoxide (CO). Intravenous (IV) injection of barbiturates and barbituric acid is the recommended form of euthanasia in most circumstances.

Comparing use of gas chamber administration of CO versus IV lethal injection and their relative costs, pain to animals, and overall effectiveness, the results are mixed. There is little scientific evidence in the literature to support that IV lethal injection causes less pain than CO euthanasia.

The Humane Society of Utah says there are 8 shelters in Utah with a gas chamber (but not all are used routinely), including the South Utah Valley Animal Shelter (SUVAS), which serves Provo. It also notes that 27 states have a complete or partial ban on use of gas chambers for animal euthanization.[ii]

Gas Chambers in State Code	Number of States
Complete Gas Chamber Ban	22
Partial Gas Chamber Ban	5
No formal ban	23

SOUTH UTAH VALLEY ANIMAL ASSOCIATION

Provo is a member of the South Utah Valley Animal Association and utilizes their corresponding animal shelter, located in Spanish Fork. The shelter offers a variety of services, including animal care and sheltering for lost and abandoned pets, animal licensing, pet adoptions and placement of animals with rescue groups, volunteer and foster programs, and community education. According to Best Friends Utah, the South Utah Valley Animal Association places about 88.35% of animals for adoption.[iii] A 90% placement rate is considered "no-kill."[iv]

UTAH ANIMAL RIGHTS COALITION PROTESTS

The Utah Animal Rights Coalition (UARC) advocates ending cruelty to animals and is currently campaigning to end the use of gas chambers in Utah. UARC claims "As of May 2021, all shelters in the state of Utah have switched to using EBI [euthanasia by injection] for dogs and cats, with only two exceptions: North Utah Valley Animal Shelter (NUVAS) and South Utah Valley Animal Shelter (SUVAS)."[v] See https://uarc.io/gas-chambers/ for UARC's arguments against the use of gas chambers.

On June 15, 2021, UARC supporters attending the Orem City Council Meeting asked the Council, during the public comment period, to ban the use of carbon monoxide for euthanasia of animals [Orem uses the NUVAS shelter]. Since the SUVAS shelter Provo uses has and uses a gas chamber, Council Chair Sewell requested that staff provide its own report comparing both carbon monoxide and injection euthanasia methods.

CARBON MONOXIDE EUTHANASIA

Carbon Monoxide (CO) is a colorless, odorless, and tasteless gas that after prolonged exposure, even in small quantities, can be fatal to both humans and animals. At concentrations of less than 12% it is nonflammable and nonexplosive. The effects of CO lead to eventual loss of consciousness and ultimately results in a condition known as hypoxemia or an oxygen deficiency.

CO induces loss of consciousness without pain and death with minimal noticeable signs of discomfort with only 4% to 6% CO concentration in the chamber. CO presents a danger to workers euthanizing with gas chamber due to the adverse effects of the gas occurring in a gradual, subtle way and may prove harmful if a leak were to occur.

Dogs euthanized with CO have been reported to experience "rapid cerebral death." Stress and blood pressure decreased significantly at the same time. Typically, dogs will "vocalize" anywhere from 20-25 seconds prior to unconsciousness. The cause for the vocalization has yet to be discovered and at this point is unclear.[vi]

During a videotape study, cats euthanized with CO were observed to have little to no discomfort, while cats euthanized with a [carbon dioxide] CO_2 + 30% O_2 [oxygen] combination behaved in a way that indicated stress and discomfort. In this same study death occurred more rapidly with pure CO than with the CO_2 + O_2 combination.[vii]

The following chart contains data detailing the time it takes for dogs to go unconscious and die at different levels of CO. This information is from a report compiled by members of the World Federation for the Protection of Animals and Institute for the Study of Animal Problems.[viii]

Percentage of Carbon Monoxide	Time till unconsciousness	Time till death	Total time
3%	5.5 minutes	14.5 minutes	20 minutes[ix]
4%	2.33 minutes	9 minutes	11.33 minutes[x]
6%	2 minutes	7.5 minutes	9.5 minutes[xi]

The use of carbon monoxide is listed by the American Veterinary Medical Association (AVMA) to be an acceptable method of euthanasia provided that the following conditions are met:

- Employees utilizing CO to euthanize animals are effectively trained and understand the hazards and limitations of CO machines.
- The CO chamber is constructed of high-quality material and provides for the separation of individual animals. If circumstances require that animals need to be combined, they should be of the same species. Furthermore, the chambers must be clean and never be overloaded.
- The CO chamber be located in a well-ventilated environment and if possible, outdoors.
- The chamber must be well lit and allow for direct observation of the animal(s) by personnel.
- The CO chamber must be able to quickly achieve a flow rate of 6% CO concentration after animals are placed in the chamber.
- If the CO chamber is utilized indoors, a CO monitor must be installed and operational.
- CO use must follow state and federal occupational health and safety regulations.
- CO should be supplied from a commercially supplied cylinder or tank in precisely regulated and purified form without contaminants.

Overall, CO euthanasia is not recommended by the AVMA for routine euthanasia of cats and dogs as there are other methods available with fewer conditions needed.[xii]

EUTHANASIA BY INJECTION

The most common euthanasia by injection (EBI) is the use of barbiturates and their derivatives. They work by depressing the central nervous system leading to unconsciousness that ends in a cardiac arrest. The process involves a single dose drug, such as sodium pentobarbital, being administered intravenously through an injection. In the event that the IV injection would cause

safety issues for the handler, distress to the animal, or is impractical due to size of the animal, an intraperitoneal (body cavity) injection can be given.[xiii]

A study from Canada in different methods of animal euthanasia reported that sodium pentobarbital sometimes resulted in vocalization, excitement, and gasping. Despite these adverse reactions, it was the most common euthanasia method used and is considered to be the best practice. This is likely due to the high speeds of death and the relatively small amounts of discomfort to the animal.[xiv]

A notable advantage to the use of barbiturates is the speed of death. Animals typically spend a small amount of time conscious provided that the IV was placed correctly and the correct dosage was used. Barbiturates can be combined with an anesthetic and induce euthanasia in a smooth way. It is claimed to be typically less expensive than other euthanasia techniques. It is also FDA-approved as a euthanasia practice and is produced in great supply.

For best results with intravenous injection, employees must be highly trained, which can lead to higher costs. In Utah, both licensed veterinarians and any animal shelter employee who is acting under the indirect supervision of a licensed veterinarian may perform euthanasia. To ensure the best environment for the handler and animal, the animal must be properly restrained. Currently, barbiturate drugs are heavily regulated by the federal government and must be accounted for. Gasping and excitement from the animal may occur after administration of the drug. Furthermore, "tissue artifacts," or enlarging of organs post-death, may occur. Despite these disadvantages, IV euthanasia is considered the best practice by many veterinary and humane organizations.[xv]

COST

A point of contention raised in the euthanasia debate is often the cost. There is little evidence showing that CO euthanasia or IV euthanasia is cheaper than the other. There are few cost comparison studies comparing these methods and they often end in contradicting results.

In 2009 the American Humane Society conducted a study and concluded that IV injection was more cost effective than CO gas chambers. With human labor included, CO was reported to cost $4.66 per animal while injection cost $2.29.[xvi]

West Valley and Taylorsville Utah Animal Services in their 2012 Euthanasia Facts and Guidelines sheet states that "Material costs for lethal injection are approximately $1.00/animal. The material cost for carbon monoxide is $.50/animal. However, the lethal injection process requires additional employee time, training and third-party certification to administer."[xvii] Human labor is not included in the West Valley statement.

North Utah Valley Animal Shelter is currently conducting a comprehensive study on the cost of CO versus IV injections, similar to the American Humane Association, and plans on having results in late summer 2021.

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[i] Underwood, Wendy, and Raymond Anthony. "AVMA guidelines for the euthanasia of animals: 2020 edition." Retrieved on March 2013, no. 30 (2020): 2020-2021. p 56-58

[ii] "Ban Gas Chamber Use in Utah." Humane Society of Utah, January 25, 2018. https://www.utahhumane.org/ban%20gas%20chambers.

[iii] "Utah: Best Friends." Utah | Best Friends. Accessed July 13, 2021. https://ww2.bestfriends.org/no-kill-2025/animal-shelter-statistics/utah?%3Alinktarget=_self&%3Aembed=yes.

[iv] "What Does It Mean to Be No-Kill?" Animal Humane Society. Accessed July 13, 2021. https://www.animalhumanesociety.org/news/what-does-it-mean-be-no-kill.

[v] "Gas Chambers: Still Killing Animals in Two Utah Shelters." Accessed July 13, 2021. www.uarc.io/gas-chambers/

[vi] Chalifoux, A., and A. Dallaire. "Physiologic and behavioral evaluation of CO euthanasia of adult dogs." American journal of veterinary research 44, no. 12 (1983): 2412-2417.

[vii] Simonsen, H. B., A. A. Thordal-Christensen, and N. Ockens. "Carbon monoxide and carbon dioxide euthanasia of cats: duration and animal behavior." British Veterinary Journal 137, no. 3 (1981): 274-278.

[viii] Carding, T. and Fox, M.W. "Euthanasia of dogs and cats: an analysis of experience and current knowledge with recommendations for research." (1978).

[ix] Carding, A. H. "Mass euthanasia of dogs with carbon monoxide and/or carbon dioxide; preliminary trials." Journal of Small Animal Practice 9, no. 5 (1968): 245-259.

[x] Moreland, A. F. "Carbon monoxide euthanasia of dogs: Chamber concentrations and comparative effects of automobile engine exhaust and car bon monoxide from a cylinder." Journal of the American Veterinary Medical Association (1974).

[xi] Ibid.

[xii] Underwood, 2020, p 27-28.

[xiii] Ibid p 33-34.

[xiv] Evans, A. Thomas, R. Broadstone, J. Stapleton, T. M. Hooks, S. M. Johnston, and J. R. McNeil. "Comparison of pentobarbital alone and pentobarbital in combination with lidocaine for euthanasia of dogs." Journal of the American Veterinary Medical Association 203, no. 5 (1993): 664-666.

[xv] Underwood, 2020, p 27-28.

[xvi] Fakkema, Doug, Consultant to Animal Care & Control, Commissioned by American Humane Association. (2009) Study Available upon Request.

[xvii] West Valley City and Taylorsville Animal Services Euthanasia Guidelines and Facts. 2012. https://www.wvc-ut.gov/DocumentCenter/View/2849/Euthanasia-Facts-and-Guidelines-PDF.

Animal Euthanasia

Carbon Monoxide & Intravenous Injection

Presented by: Michael Sanders - Council Intern

Euthanasia

- Greek roots meaning “an easy or happy death”
  - “EU” meaning good
  - “THANATOS” meaning death
- Euthanasia is used to end the suffering of an animal that cannot be revived by medical means or to put down an animal that is too aggressive to be placed back into the community.
- The method chosen to euthanize the animal must be balanced between the safety of the workers with what is most humane for the animal.

Euthanasia Methods

- Non-inhaled agents
- Inhaled agents
- Physical methods

South Utah Valley Animal Association

- Located in Spanish Fork
- Involved in animal care and sheltering for lost and abandoned pets, animal licensing, pet adoptions and placement of animals with rescue groups, volunteer and foster programs, and community education.
- According to Best Friends Utah, the South Utah Valley Animal Association places about 88.35% of animals for adoption. A 90% placement rate is considered “no-kill”
- Utilizes a CO chamber for euthanizing

Carbon Monoxide

- Odorless, colorless, tasteless
- Prolonged exposure leads to loss of consciousness and ultimately results in hypoxemia or an oxygen deficiency causing death
- Euthanasia involves placing the animal into a glass paned and well-lit chamber that utilized CO canisters that distributes gas to achieve a CO concentration of at least 6%

Carbon Monoxide In Code

- State law is mixed regarding the use of Carbon Monoxide for animal euthanasia
- Utah State Code has no formal ban on the use of CO
- A bill to ban CO euthanasia in UT has failed in the past 8 legislative sessions
- The Humane Society of Utah estimates there are about 8 shelters that currently use CO for euthanasia

Gas Chambers in State Code	Number of States
Complete Gas Chamber Ban	22
Partial Gas Chamber Ban	5
No formal ban	23

Carbon Monoxide Studies

- Dogs euthanized with CO experience “rapid cerebral death”
- Dogs sometimes “vocalize” 20-25 seconds prior to unconsciousness
  - The cause is unclear, not thought to be pain
- Cats experience little to no discomfort with euthanized with pure CO
  - However, when a combination of Carbon-dioxide and 30% Oxygen, cats indicated stress and discomfort

Carbon Monoxide Studies

Percentage of Carbon Monoxide	Time till unconsciousness	Time till death	Total time
3%	5.5 minutes	14.5 minutes	20 minutes
4%	2.33 minutes	9 minutes	11.33 minutes
6%	2 minutes	7.5 minutes	9.5 minutes

AVMA Carbon Monoxide Conditions

Employees utilizing CO to euthanize animals are effectively trained and understand the hazards and limitations of CO machines.

The CO chamber is constructed of high-quality material and provides for the separation of individual animals. If circumstances require that animals need to be combined, they should be of the same species. Furthermore, the chambers must be clean and never be overloaded.

The CO chamber be located in a well-ventilated environment and if possible, outdoors.

The chamber must be well lit and allow for direct observation of the animal(s) by personnel.

The CO chamber must be able to quickly achieve a flow rate of 6% CO concentration after animals are placed in the chamber.

If the CO chamber is utilized indoors, a CO monitor must be installed and operational.

CO use must follow state and federal occupational health and safety regulations.

CO should be supplied from a commercially supplied cylinder or tank in precisely regulated and purified form without contaminants.

Intravenous Injection

- Employ a single dose drug that is administered through an IV injection
- Depresses the central nervous system leading to unconsciousness and ends in cardiac arrest
- Due to the nature of the drugs used, the are strictly regulated by the US DEA
- Bodies must be disposed of carefully due to the drug remaining in the body of deceased animal

Intravenous Injection Studies

- IV injection can sometimes result in vocalization, excitement, and gasping
- IV injection results in rapid death provided proper doses are used
- Can be combined with an anesthetic
- Most common euthanasia technique
- Considered by many leading veterinary associations to be the best practice

Cost

- Evidence on which option has a lower cost is split
- Not much research has been done on this subject
- American Humane Society claims that IV injection is cheaper (2009)
- West Valley/Taylorsville Utah Animal Services claim CO gas is cheaper (2012)
- North Utah Valley Animal Shelter is currently conducting an in-depth study on comparative costs

Questions?

The Truth Regarding Animal Euthanasia

Kierstan Munford – DIRECTOR
South Utah Valley Animal Services
801-851-4084

For 8 consecutive years animal rights groups have tried to pass legislation in Utah that would ban the use of carbon monoxide as a means of animal euthanasia. Each year these initiatives have failed. Currently, attempts are being made to influence city leaders by sending emails that contain misleading, inaccurate, and inflammatory information that is neither backed by science nor gained from experience.

This letter will attempt to correct inaccurate statements and clarify our position and reasoning with regard to animal euthanasia at South Utah Valley Animal Services (SUVAS). This letter is not an attempt to disparage any group or individual whose opinions or views contradict our own.

The most difficult and unfortunate part of animal sheltering involves the unpleasant task of having to euthanize animals. South Utah Valley Animal Services performs animal euthanasia for two reasons:

1. To end the suffering of an animal: i.e., putting to sleep those animals who are suffering due to extreme illness or injury, rather than allowing them to suffer to death.

2. To protect the safety of the public: i.e., putting to sleep those animals who exhibit aggressive behavior that is deemed dangerous.

Since its inception in January 2003, SUVAS has performed animal euthanasia utilizing both carbon monoxide (CO) and injection of sodium pentobarbital. After years of experience, it was decided that CO would be the primary method of animal euthanasia for several reasons, paramount among them being the following:

- CO is superior in providing a humane death versus other methods.
- CO is safer and far less traumatic to those conducting animal euthanasia versus other methods.

Our decision to utilize CO is based on years of experience and is well supported by science. The American Veterinary Medical Association (AVMA) publishes the AVMA Guidelines for the Euthanasia of Animals. This publication is updated every 10 years or earlier with the latest edition having been published in 2020. In that edition, the AVMA lists the following advantages of using CO for animal euthanasia:

- CO induces loss of consciousness without pain.
- CO works without the animals understanding of what is happening to them, thus they are not frightened.
- CO works rapidly so the animals do not suffer.

The AVMA goes on to state that utilizing CO for animal euthanasia is an acceptable method if all safety and procedural conditions are met. SUVAS meets, or exceeds, all of these conditions.

Animal rights groups often make claims that are untrue, misleading, and/or not supporter by science. It should also be noted that most animal rights activists have never performed or witnessed animal euthanasia by any method. The following list, while not being comprehensive of their claims, is representative. Accurate information that refutes such claims has been provided in bold italics.

- Animals try to claw their way out of the CO chamber: *In our 15 plus years of operation we have never once witnessed this behavior.*

- It takes 30 minutes to an hour to euthanize animals with CO: *The average time for an animal to go unconscious is 83 seconds; the average time for an animal to quit breathing is 172 seconds.*

- Animals are asphyxiated or suffocated by the CO: *Carbon monoxide induces a state of hypoxia, meaning that the animals experience a lack of oxygen reaching their brain, which quickly and painlessly induces unconsciousness followed shortly by a humane death. They are not asphyxiated or suffocated*.

- The "gas chambers" incinerate the animals to death: *Carbon monoxide units, professionally designed for animal euthanasia, are not capable of incineration and do not produce any heat whatsoever.*

- The animals are scared because they understand that death is imminent: *The AVMA states that carbon monoxide is "insidious," meaning that it is subtle, the animals do not understand what is happening to them, and are therefore not frightened.*

- Using CO for animal euthanasia is painful: *As stated previously, the AVMA states that "carbon monoxide induces loss of consciousness without pain." Additionally, they state that "An unconscious animal is…by definition, unable to perceive pain."*

The trauma and emotional distress experienced by animal service workers who have the difficult task of animal euthanasia should not be overlooked. Carbon monoxide euthanasia has a far less emotional impact on animal service workers than other methods. The process is quick and humane to both the animals and the workers.

To conclude, nothing in this statement should be construed as accusatory or defamatory to those who hold opposing opinions. More accurately, this statement is an effort to put decision makers in possession of the facts regarding the use of carbon monoxide as a means of animal euthanasia.

Moreover, we support people and organizations interested in compassionate animal welfare and responsible public safety and invite civil dialogue that encourages cooperation and progresses toward successful outcomes for the animals in our care and the people we serve.

Should you have any questions, please feel free to contact me directly.

PROVO MUNICIPAL COUNCIL STAFF REPORT

Submitter: SCOTTH
Department: Parks and Rec
Requested Meeting Date: 06-15-2021

SUBJECT: A Presentation on Technical Findings from the Provo Parks and Recreation Master Plan. (21-046)

RECOMMENDATION: Presentation and feedback from Municipal Council

BACKGROUND: Pros Consulting will present the findings from technical data related to the Provo Parks and Recreation Master Plan in process.

FISCAL IMPACT: No immediate

PRESENTER'S NAME: Mike Svetz, Pros Consulting

REQUESTED DURATION OF PRESENTATION: 30 minutes

COMPATIBILITY WITH GENERAL PLAN POLICIES, GOALS, AND OBJECTIVES:
The Provo Parks and Recreation Master Plan is compatible and integrated into the General Plan, policies, goals and objectives of Provo City.

CITYVIEW OR ISSUE FILE NUMBER: 21-046

PROVO MUNICIPAL COUNCIL STAFF REPORT

Submitter: JMCKNIGHT
Department: Public Works
Requested Meeting Date: 07-06-2021

SUBJECT: A presentation regarding the Westside Levee Plan. (21-079)

RECOMMENDATION: Presentation only.

BACKGROUND: The West Side Levee Plan examines the levees along the Provo River as well as those around the airport to examine their existing condition as well as determine what will need to happen to obtain Federal Emergency Management Agency (FEMA) accreditation. Provo City and the CRS Engineers team have partnered to study the levees along the lower Provo River and Utah Lake and to develop a plan to certify existing levees. This report has been prepared to document the existing conditions of the levees; present alternatives for rehabilitating the levees so that Federal Emergency Management Agency (FEMA) accreditation can be obtained; and recommendations for moving forward with a preferred alternative.

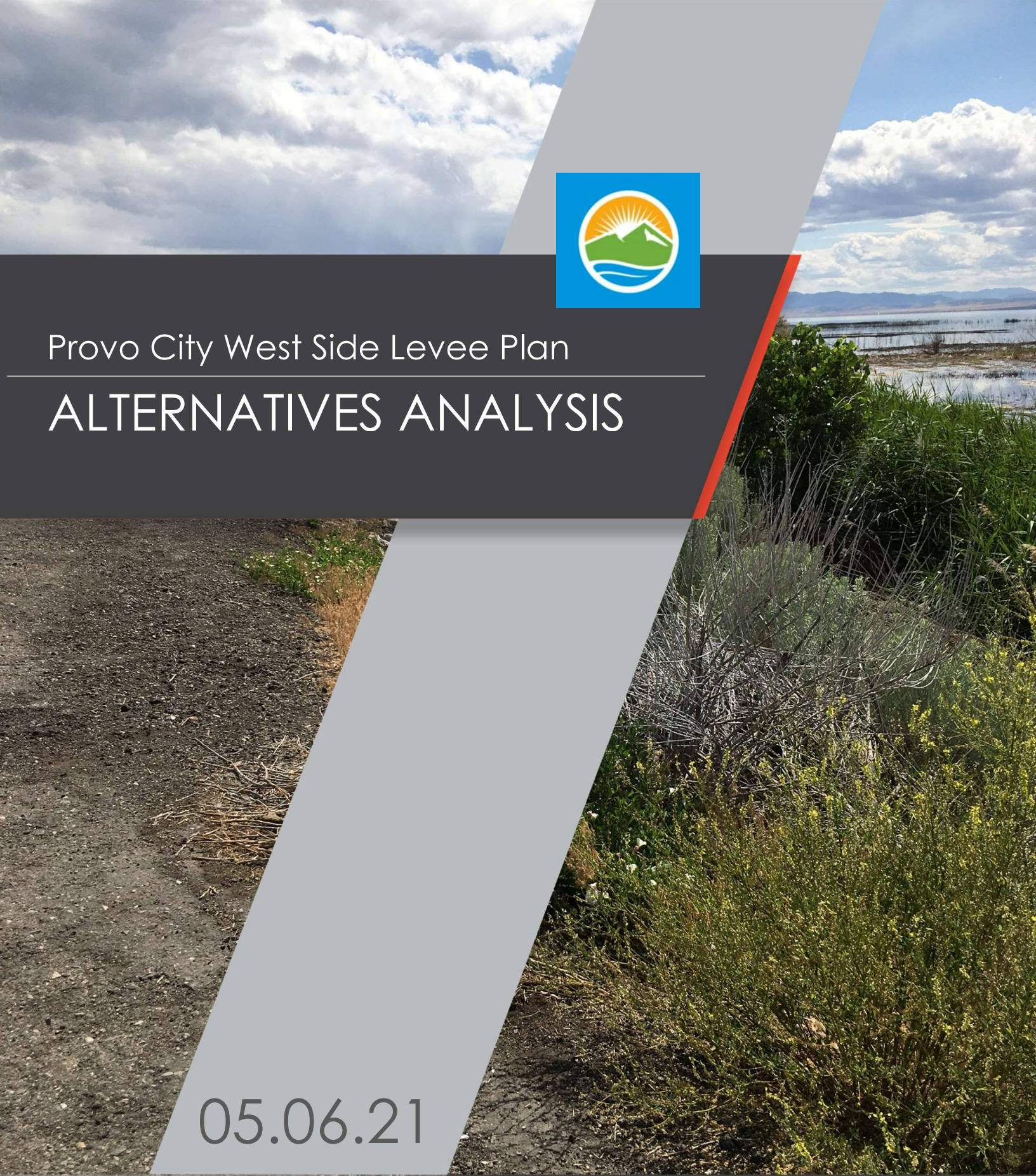
FISCAL IMPACT:

PRESENTER'S NAME: Brian Torgersen, Ben Rood-CRS Engineers

REQUESTED DURATION OF PRESENTATION: 60 minutes

COMPATIBILITY WITH GENERAL PLAN POLICIES, GOALS, AND OBJECTIVES:

CITYVIEW OR ISSUE FILE NUMBER: 21-079



Provo City West Side Levee Plan

ALTERNATIVES ANALYSIS

05.06.21

Prepared by CRS Engineers
4246 S. Riverboat Rd, Ste 200 | SLC, Utah 84123
O. 801.359.5565 | F. 801.359.4272

Provo City West Side Levee Plan

ALTERNATIVES ANALYSIS

provo
PUBLIC WORKS
STORM WATER

Prepared for:

Provo City Department of Public Works
1377 South 350 East
Provo, UT 84606

Prepared by the CRS Engineers Project Team:

CRS Engineers
4246 S. Riverboat Rd, Ste 200 | SLC, Utah 84123
O. 801.359.5565 | F. 801.359.4272

Allred Restoration
5725 W. 12000 N. | Tremonton, UT 84337

BIO-WEST, Inc.
1063 W. 1400 N. | Logan, UT 84321

Gerhart Cole, Inc.
7657 S. Holden St. | Midvale, UT 84047

Michael Baker International
7090 S. Union Park Ave. #500 | Midvale, UT 84047

CRS

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ACRONYMS

BCA. *Benefit Cost Analysis*
BCR. *benefit-cost ratio*
CM/GC. *construction manager/general contractor*
CPT. *cone penetration testing*
DCP. *dynamic cone penetration*
DEM. *Utah Division of Emergency Management*
DWQ. *Utah Division of Water Quality*
DWRi. *Utah Division of Water Rights*
EPA. *Environmental Protection Agency*
FAA. *Federal Aviation Administration*
FEMA. *Federal Emergency Management Agency*
FIRM. *Flood Insurance Rate Map*
GIS. *Geographic Information System*
HEC-RAS. *Hydrologic Engineering Center River Analysis System (hydraulic modeling software)*
LAMP. *Levee Analysis and Mapping Procedure*
LEDPA. *Least environmentally damaging practicable alternative*
NRCS. *Natural Resources Conservation Service*
SPT. *standard penetration test*
UDOT. *Utah Department of Transportation*
UPDES. *Utah Pollution Discharge Elimination System*
USACE. *United States Army Corps of Engineers*
USBOR. *United States Bureau of Reclamation*
WSE. water surface elevation

EXECUTIVE SUMMARY

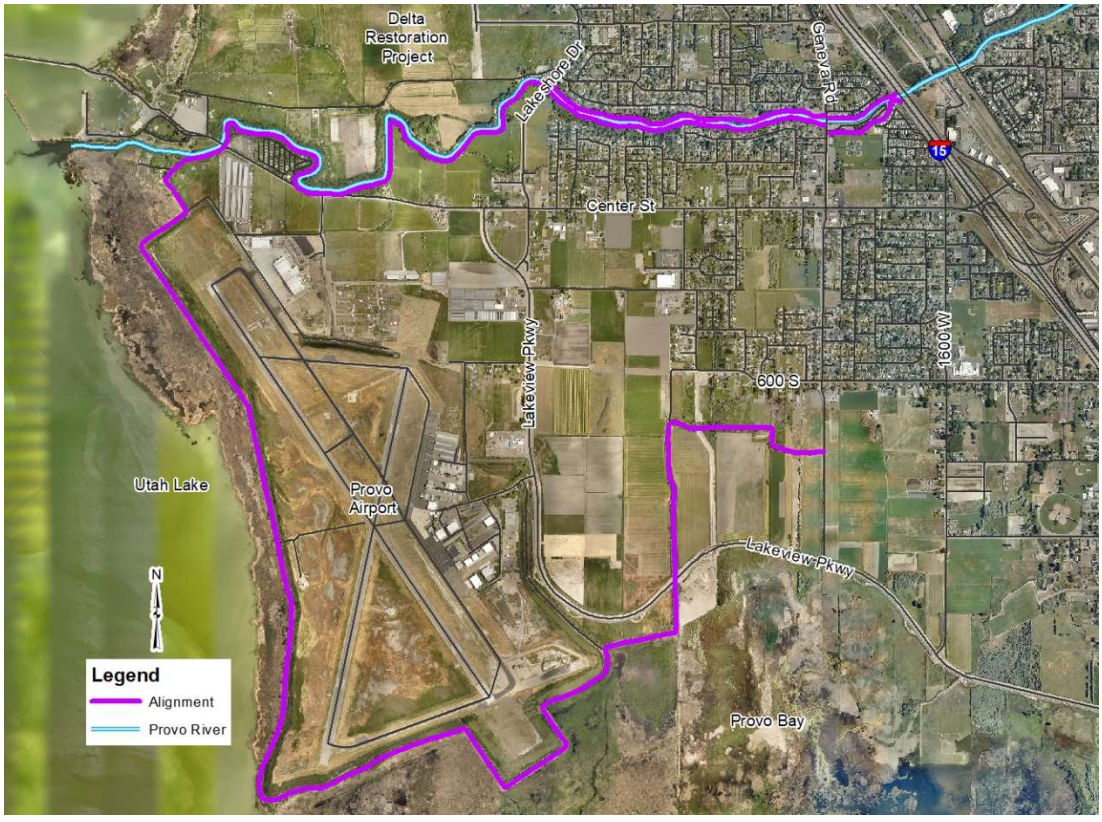
INTRODUCTION. Provo City and the CRS Engineers team have partnered to study the levees along the lower Provo River and Utah Lake and to develop a plan to certify these levees. This report has been prepared to document the existing conditions of the levees; present alternatives for rehabilitating the levees so that Federal Emergency Management Agency (FEMA) accreditation can be obtained; and recommendations for moving forward with a preferred alternative.

Background. In 1983 and 1984, the United States Army Corps of Engineers (USACE) constructed improvements on what had previously been smaller levees along the lower Provo River and Utah Lake as an emergency measure to mitigate historic flooding along the Provo river and Utah lake. The current FEMA Flood Insurance Rate Maps (FIRMs) show the Provo levees providing 1%-annual-chance flood protection to a significant amount of Provo west of I-15, including the Provo Airport. FEMA is planning to update Provo City's FIRMs and will no longer show base flood protection by the levees due to lack of required documentation for levee certification.

FEMA's action could add hundreds of existing residential and commercial structures, an elementary school, two churches, significant developable land, and the Provo Airport to the FEMA floodplain, thus requiring property owners to carry flood insurance at a cost of approximately $600 to $1,150 annually, and potentially as high as $6,000 annually depending upon the coverages that are selected.

The location of the Provo levee system is shown in Figure ES-1, and consists of a lakeside and riverside levee. The lakeside levee is 5-½ miles in length and acts as a flood protection barrier to Utah Lake waters that could potentially inundate the Provo Airport and vicinity. The levee is generally located on the south and west sides of the airport and connects to the Provo River levee system near Center Street. The riverside levees are located along the north and south sides of the Provo River from I-15 to Lakeshore Drive and provide flood protection to residential areas adjacent to the river.

Figure ES-1: Location Map of Provo Levee System



CERTIFICATION REQUIREMENTS AND EXISTING DEFICIENCIES. The project team has performed an assessment of the existing levees to evaluate whether the levee system meets the requirements of *44 CFR §65.10 – Mapping of Areas Protected by Levee Systems* and to document any deficiencies that exist. Table ES-1 summarizes the findings of this assessment. Deficiencies were identified for both the riverside and lakeside levees that render the levees not certifiable in their current state.

Table ES-1: Summary of Existing Levee Deficiencies

Category	Riverside Levees	Lakeside Levee
Freeboard	✗ 49% of the north levee and 32% of the south levee length has less than 3 feet of freeboard	✓ Freeboard is sufficient
Closures	✗ No levee penetrations had proper closure devices	✗ No levee penetrations had proper closure devices
Embankment Protection	✗ Little to no bank protection	✗ Rip rap not keyed in properly
Embankment Stability	✗ Undocumented/poorly compacted embankment materials, vegetation /root penetration	✗ Undocumented/poorly compacted embankment materials, vegetation /root penetration
Interior Drainage	✗ Leisure Village area has no outlet; Riverview pump station may not have sufficient capacity for 1%-annual-chance storm	✗ Airport pump station may not have sufficient capacity for 1%-annual-chance storm
Vegetation Management	✗ Heavy vegetation including large trees found in vegetation-free zone	✗ Top has been maintained; side slopes have deep-rooted brush
Right-of-way and Encroachments	✗ The levees occupy 3.8 acres of land on 49 different parcels that are not owned by the City	✓ The City has ownership of the levee and adjacent airport property

LEVEE REHABILITATION PROJECT OBJECTIVES. Since the levees are not certifiable in their present condition, a rehabilitation project will be necessary to gain flood protection in the west part of the City. Several objectives should be considered in the approach, planning and design of a project:

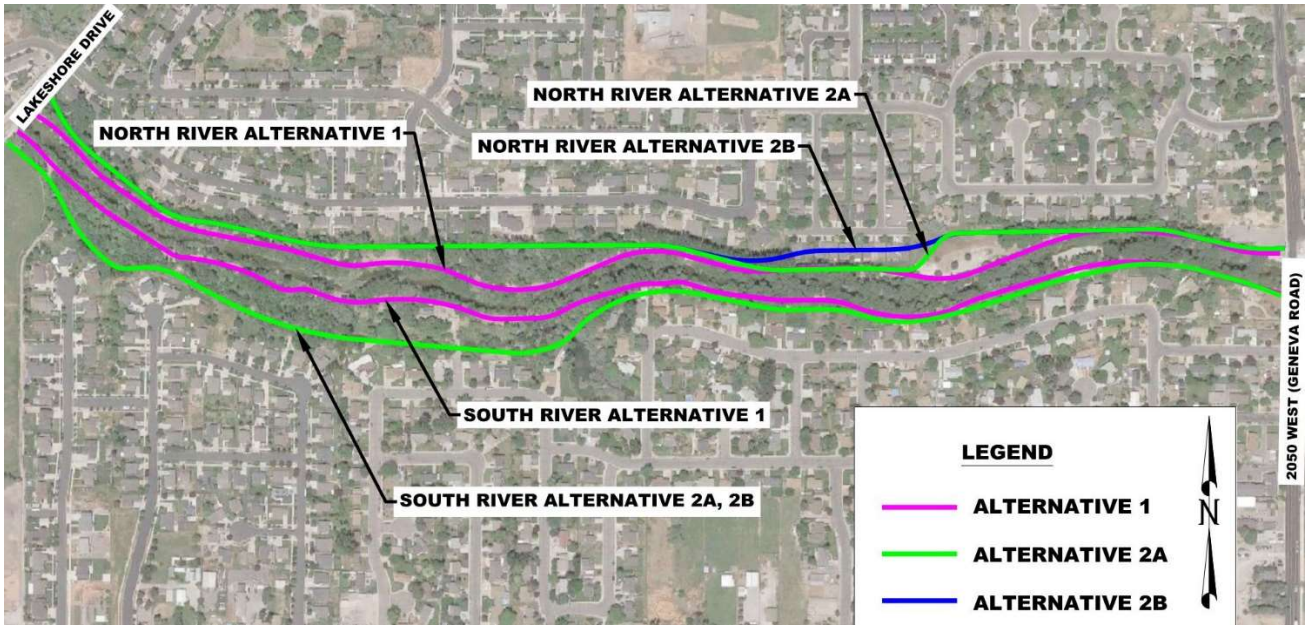
- **Flood risk protection**. The levees will need to meet the FEMA criteria for freeboard, positive closure devices, embankment protection, embankment and foundation stability, interior drainage, operation and maintenance, and right-of-way access.
- **Environmental.** Environmental permitting will be required for any project in the area due to the presence of endangered and threatened species. It will be important to minimize negative impacts to these species.
- **Beneficial use/recreation.** The Provo River Parkway Trail runs along the north riverside levee and is a valued community asset.
- **Minimization of property acquisition**. Provo City does not own all of the property that the levee currently occupies, and additional property may be needed to gain enough space to meet project requirements for the levee and riverine habitat.
- **Cost.** The cost of the levee project will likely be significant for Provo City, and will certainly be a factor in selecting the appropriate design solution as any project(s) moves forward.

PROPOSED LEVEE CROSS SECTION. Many levee embankment options were considered including sheet piles, secant piles, cutoff walls, inverted T-walls, box culverts, reconstruction in place, and setback levees. Due to cost considerations, environmental and community impacts as well as construction risks, the preferred alternative is a traditional earthen embankment, constructed either in-situ or relocated behind the existing levee. An inverted T-wall may also be a viable alternative in areas where it is desirable to reduce the width of the levee cross section and settlement risk are low such as along segments of the riverside levees.

A proposed certifiable embankment cross section has been developed with landside side-slopes of 2:1 and waterside side-slopes of 3:1. The height will be set at three feet above the 1% annual-chance water surface elevation (WSE) with a crest that is 12 feet wide.

ALIGNMENT ALTERNATIVES. Three alternatives are proposed and are identified as 1, 2A and 2B (Figure ES-2). Each alternative is comprised of segments of levee reconstruction in-place or setback levees, with selective use of the inverted T-wall. In all three alternatives, the lakeside, Leisure, and KOA levees are to be replaced in situ. For Alternative 1, the riverside levees would also be replaced in situ. For Alternative 2A, the riverside levees would be set back from the existing levees. Alternative 2B is the same as 2A with the exception of a segment along the north riverside levee that is set back further.

Figure ES-2: Three Alignment Alternatives – Segment Between Lakeshore Dr. and Geneva Road



Alternative 1 consists of complete removal of existing, non-certifiable levees and construction of new levees in the same location. The existing trail and existing vegetation (including trees) will be removed as part of construction and long-term levee maintenance. The trail will be rebuilt on the north levee, but its character will be changed by the removal of trees. Limited property acquisition is anticipated as part of this alternative. River restoration opportunities would be very limited and riverine habitat would be significantly degraded.

Alternative 2A consists of new levees along the north and south sides of the river set back from (or "outside") of the existing levees along a new alignment. The existing levees will remain in-place with modifications to allow for river flows to move outside of the existing levee system during periods of higher river flow yet be contained by the new levee system. The existing trail and vegetation will largely remain in place. Property acquisition of partial and full properties is anticipated as part of this alternative. This alternative would provide considerably more space for riverine processes and functions.

Alternative 2B is very similar to Alternative 2A, with the only difference in alignment being a stretch along the north side of the river from approximately 2330 West to 2460 West, in which it is proposed that the levee be set back even further to allow more space for river restoration. To gain this additional space, the acquisition of 10 full properties

located on 390 North would be required. The existing levees will remain in-place with modifications to allow for river flows to move outside of the existing levee system yet be contained by the new levee system. The existing trail and vegetation will largely remain in place. Of the alternatives considered, Alternative 2B clearly offers the most potential for benefits from restoration efforts while implementing the vegetation management necessary for levee protection.

BENEFIT-COST ANALYSIS. In the simplest terms, the Benefit-Cost Analysis (BCA) compares the benefit of the project, which is to avoid the cost of flood inundation damages and flood insurance, against the cost to construct and rehabilitate the levees. The results of the preliminary (concept-level) BCA is a Benefit-Cost Ratio (BCR) greater than 1.0 for all three alternatives. The benefits of property protection outweigh the cost of levee improvements based on the preliminary analysis and engineering performed. Table ES-2 summarizes the BCA results.

Table ES-2: Benefit-Cost Analysis Results Summary

Description	Estimated Project Cost	Estimated Total Flood Damage Assessment Cost	Net Project vs. Flood Damage Cost	Benefit/Cost Ratio
Alternative 1	$74,520,832	$109,054,038	$34,533,206	**1.46**
Alternative 2A	$51,428,707	$109,054,038	$57,625,331	**2.12**
Alternative 2B	$54,504,760	$109,054,038	$54,549,278	**2.00**
"Do Nothing" Alternative	$0	$109,054,038	$109,054,038	**n/a**

RECOMMENDED ALTERNATIVE. The three levee rehabilitation alternatives are compared in Table ES-3 below with respect to each of the major criteria that are important to Provo City. Each criterion is ranked as low, medium, or high for each alternative with a corresponding color scheme in which green is favorable and yellow/orange is less favorable.

Table ES-3: Alternatives and Criteria

Criteria	Alternative 1	Alternative 2A	Alternative 2B
Affordability	Low $74.5M B/C Ratio = 1.46	High $51.4M B/C Ratio = 2.12	Medium $54.5M B/C Ratio = 2.00
Flood risk protection/FEMA certifiability	High	High	High
River restoration potential/ environmental permit-ability	Low (potentially not feasible)	Medium	High
Recreational quality and aesthetic characteristics	Low	High	High
Minimization of private property acquisition	High 58 partial parcels = 5.60 ac + 2 full parcels	Medium 93 partial parcels = 7.62 ac + 9 full parcels	Low 93 partial parcels = 7.75 ac + 19 full parcels

Alternative 1 is not recommended due to the high cost and lowest BCR; the environmental consequences and subsequent difficult path to permitting; and the loss of the aesthetic character of the riverside levees and trail as most of the vegetation is cleared. This leaves Alternative 2A and 2B, which are both excellent alternatives in terms of feasibility of environmental permitting and retaining much of the vegetation around the riverside and trail. The cost and many other aspects of these two alternatives are similar; the biggest difference is in the additional river habitat area that Alternative 2B provides, at a cost of 10 additional full-parcel acquisitions. Alternative 2A is recommended over 2B due to the higher cost and more acquisitions; however, environmental permitting constraints may cause Alternative 2B to be more feasible.

Other project considerations:

- **River restoration**. Alternative 2A has the potential to improve the channel with regard to many important river restoration factors, such as greater space and connectivity of the river to its floodplain and more opportunities for channel dynamics and complexity. Alternative 2B will perform better than Alternative 2A by allowing more space for riverine processes and thus greater natural channel dynamics, continuity, and complexity.
- **Delivery alternatives**. The risks and benefits of traditional methods such as design-bid-build as well as alternative delivery methods, including construction manager/general contractor and design-build, should be considered.
- **Permitting**. The project will require permitting from the Federal Aviation Administration, Utah Department of Transportation, US Army Corps of Engineers 404 permit, Stream Alteration Permit, and other entities.
- **Phasing and timeline.** The key to any project of this magnitude is to plan for the long-term and start early to mitigate risks to the cost and schedule of the project. Completion of this project is expected to take several years with a significant phase for securing funding and environmental permitting.

OPERATION AND MAINTENANCE PLAN. An Operation and Maintenance (O&M) Manual will be required as part of the levee certification process. Maintenance of the levees is critical to keeping them certified as flood control structures. A critical component of the O&M Manual is the vegetation management plan. Vegetation management is necessary to protect the new levees and to make the project more desirable from a variety of permitting and NEPA perspectives. Once root intrusion has occurred, the stability of the levee is jeopardized, and it is virtually impossible to restore the structural integrity of the embankment.

FUNDING. There are several potential funding sources for this project at the federal, state, and local levels that are targeted to the different aspects of this project including flood mitigation, infrastructure, and environmental mitigation. It is recommended that an in-depth funding analysis be conducted to determine which programs are the best fit for this project and are the most likely to produce results.

1.0 INTRODUCTION

Provo City and the CRS Engineers team have partnered to study the levees along the lower Provo River and Utah Lake and to develop a plan to certify these levees. This report was prepared to document the existing conditions of the levees, alternatives for rehabilitating the levees so that Federal Emergency Management Agency (FEMA) accreditation can be obtained, and recommendations for moving forward with a preferred alternative. Provo City is funding this study in part through a grant from the FEMA Pre-Disaster Mitigation Advance Assistance Grant program.

This study includes identification of project objectives, levee cross section selection, geotechnical analysis, hydraulic modeling, environmental analysis, construction cost estimation, benefit-cost analysis, permitting overview, potential funding opportunities and an estimated project schedule.

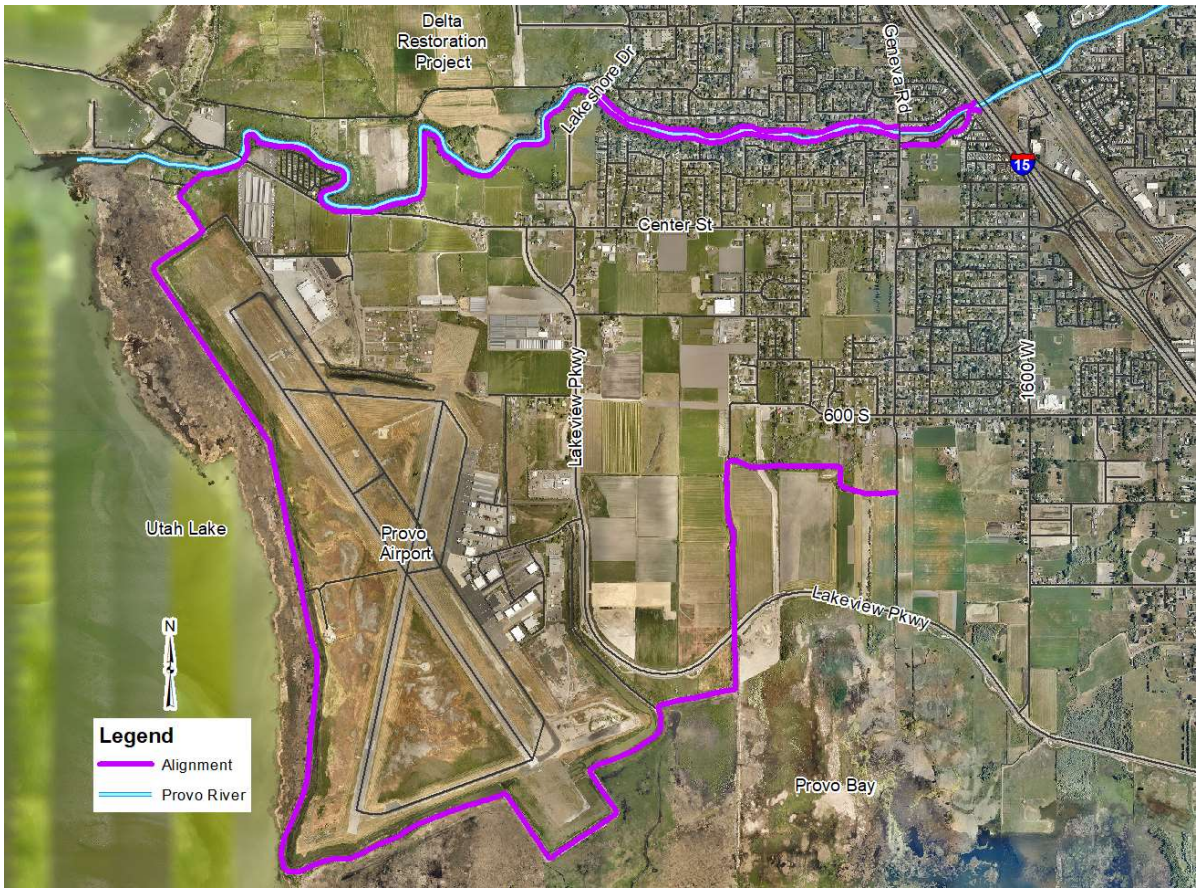
WHAT IS A LEVEE?

A levee is a human-made structure, usually an earthen embankment, designed to control the flow of water to reduce risk from temporary flooding. They are often built parallel to a waterway to reduce the risk of flooding on the landward side.

1.1 Background

In 1983 and 1984, the United States Army Corps of Engineers (USACE) constructed improvements on what had previously been smaller levees along the lower Provo River and Utah Lake as an emergency measure to mitigate historic flooding in the river and lake. Figure 1-1 shows the general area that was evaluated in this study.

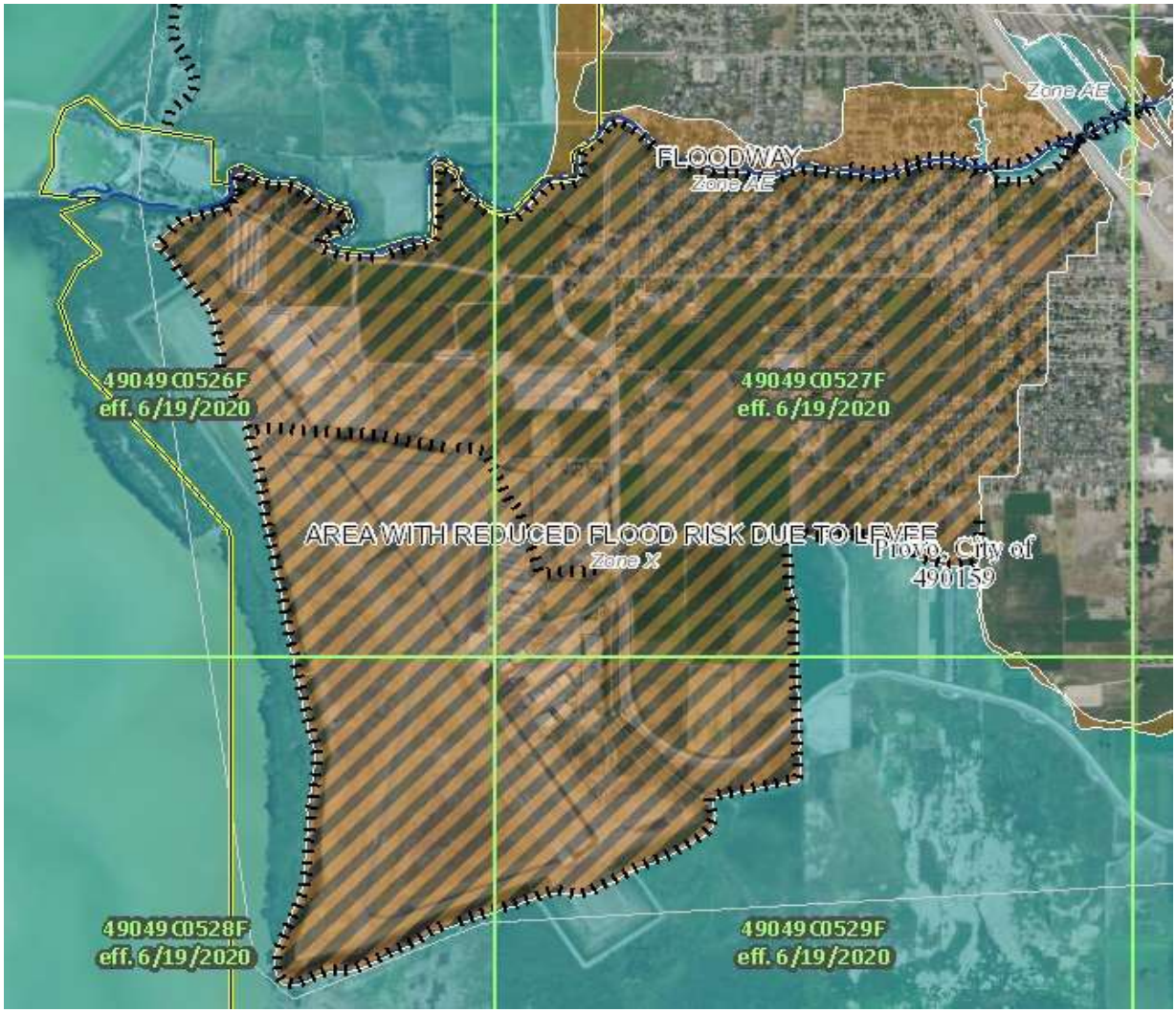
Figure 1-1: General Location Map of Study Area in Provo, Utah



Because the levees were installed quickly as an emergency flood control measure, USACE did not certify the design or the construction of the levees. Control and maintenance of the levees was then turned over to Provo City and USACE does not include these levees in the Periodic Inspection Program. In 1988, the current FEMA Flood Insurance

Rate Maps (FIRMs) became effective, which show the Provo levees providing 1%-annual-chance flood protection for a significant area of Provo west of I-15, including the Provo Airport, as seen in Figure 1-2. The brown shaded areas indicate reduced flood risk due to the levees.

Figure 1-2: Effective FIRMs for Provo Levees (soon to be outdated)

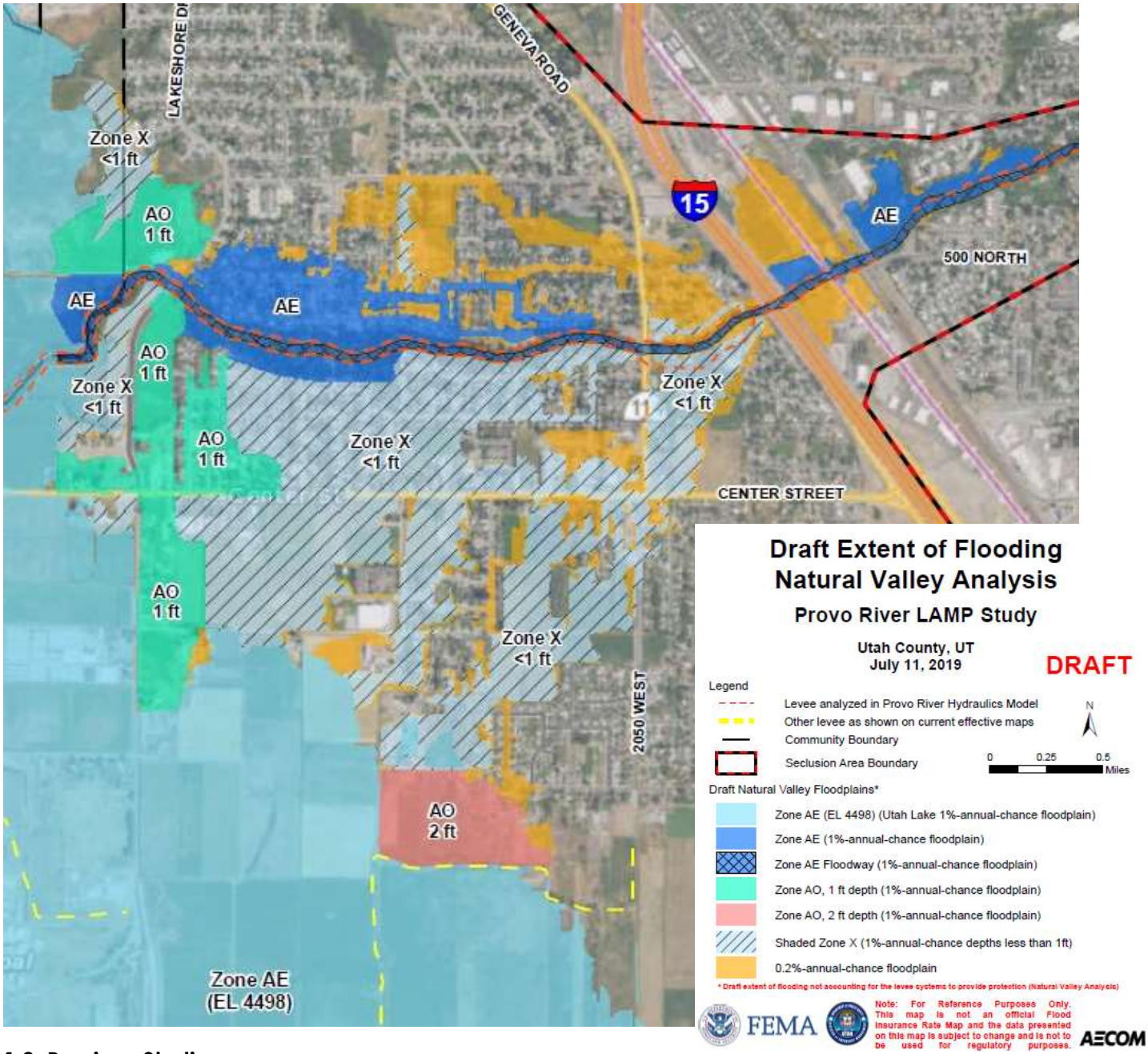


In coordination with the Utah Division of Emergency Management (DEM), FEMA will be updating and digitizing Provo City's FIRMs. It is anticipated that the updated FIRMs will no longer show base flood (1%-annual-chance) protection by the levees, as FEMA has determined that there is a lack of required documentation for levee certification. It is important to note that although the levees appear to be functioning adequately, they must meet FEMA requirements to be accredited by FEMA. FEMA's action could add hundreds of existing residential and commercial structures, an elementary school, two churches, significant developable land, and the Provo Airport to the FEMA floodplain, as seen in the draft extent of flooding from FEMA's Provo River Levee Analysis and Mapping Procedure (LAMP), as shown in Figure 1-3. The LAMP analysis assumes that the levee system will not provide any flood protection. When the floodplain is re-mapped to a flood zone that requires flood insurance, homeowners with mortgages in the affected area will be required to carry flood insurance at a cost of approximately $600 to $1,150 annually, and up to $6,000 per year for maximum coverages. Refer to Section 10.0 – References for a listing of sources used to estimate flood insurance costs.

IMPACT OF REMAPPING

When FEMA updates the FIRM, the flood classification for **hundreds of homes will be remapped to a flood zone that requires flood insurance**, which costs in the range of $600 - $6,000 per year.

Figure 1-3: Draft Extent of Flooding from FEMA Provo River LAMP Study (dated July 11, 2019)



1.2 Previous Studies

A study by USACE in 1997, and another report commissioned by Provo City that was prepared by Bowen Collins & Associates in 2007, determined that deficiencies in the levees located along the Provo River based on the best available data at that time. Potential improvements were identified in both documents to raise and provide embankment protection to the levees. Geotechnical analyses to determine the riverside and lakeside levee stability and seepage potential were not included in the commissioned tasks for either report.

1.3 Description of Lakeside Levee

The Utah Lake levee system, shown in Figure 1-4, consists of an existing levee that is 5-½ miles in length and acts as a barrier to Utah Lake waters that could potentially inundate the Provo Airport and vicinity. The levee is generally located on the south and west sides of the airport and connects to the Provo River levee system near Center Street. The landside (i.e., airport side) of the levee has a drainage channel located generally parallel to the levee. This

drainage channel is often referred to as the "moat" or "levee moat" and conveys stormwater from west Provo and the airport around the airport with water flowing west and north. A pump station located at the northern terminus of the moat pumps water to Utah Lake (through the levee). Another pump station is planned to be constructed at the south end of the Utah Lake levee. A typical cross section of the lakeside levee is shown in Figure 1-5.

Figure 1-4: Lakeside Levee

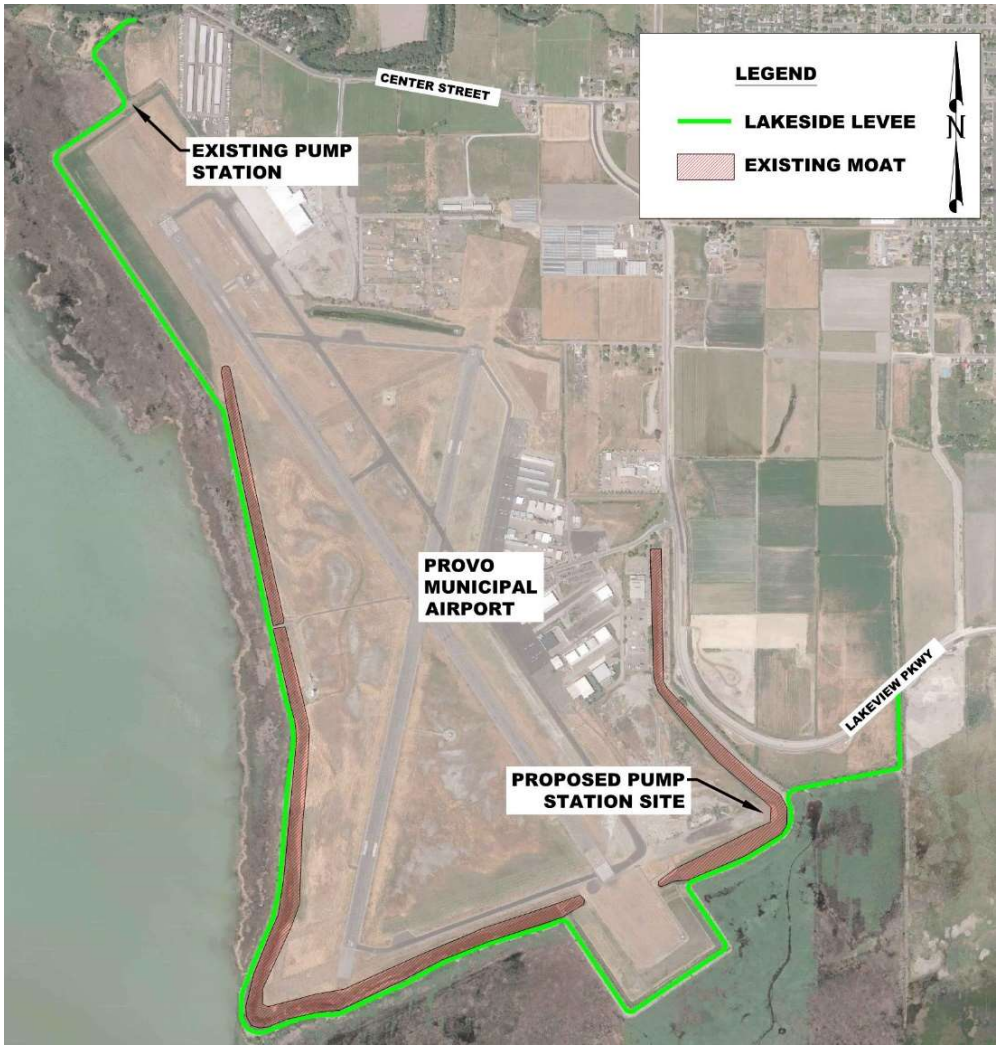
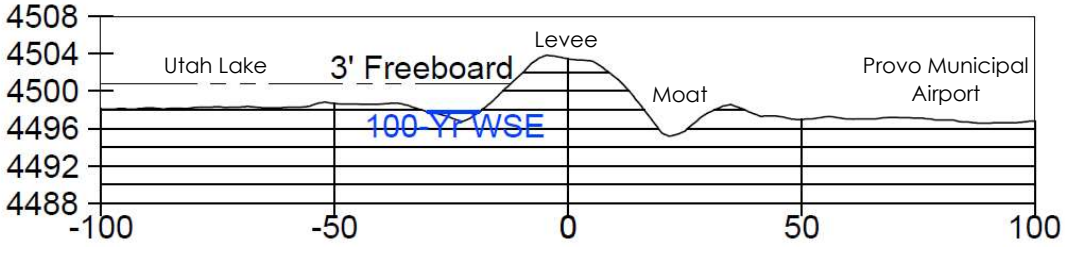


Figure 1-5: Cross-Section of Lakeside Levee (NAVD 88 vertical datum)



1.4 Description of Riverside Levees

The riverside levee system, shown in Figure 1-6, consists of levees that are located on the north and south sides of the Provo River east of Center Street and west of I-15. Subsets of the riverside levees are further described below.

Figure 1-6: Riverside Levees



Lower River Levee – West (Center Street to Halliday Property)

Along the lower river, there is a levee along the south side but not on the north side. The levee acts as a barrier to Provo River waters that could potentially inundate several properties south of the river.

Lower River Levee – East (Halliday Property to Lakeshore Drive)

This stretch of the levee was not studied as part of this report. The south levee is anticipated to become obsolete based on planned development in which low-lying areas on the landside of the south levee between Center Street and the river will be filled with material as development occurs to bring grades up to the elevation at which a levee will not be needed. A levee will not be needed north of the river due to ongoing efforts related to the Provo River Delta Restoration project being completed by the Utah Reclamation Mitigation and Conservation Commission as part of the Central Utah Project Completion Act.

Riverside Levee South

The existing riverside south levee is located south of the Provo River from Lakeshore Drive to Geneva Road and spans 5,035 feet in length. The levee acts as a barrier to Provo River waters that could potentially inundate properties south of the river. The landside is made up of residential areas and a pump station located along this levee pumps stormwater flows from the residential neighborhood into the Provo River.

Riverside Levee North

The existing riverside north levee is located north of the Provo River from Lakeshore Drive to Geneva Road and spans 4,908 feet in length. The levee acts as a barrier to Provo River waters that could potentially inundate properties north of the river. The landside is made up of residential areas.

Riverside Levee KOA (south side of river)

The existing riverside levee KOA (i.e., KOA levee) is located south of the Provo River from Geneva Road to I-15, spanning 1,464 feet in length. The area between the river and the levee was previously a KOA campground, but was purchased by Provo City and is now open space. The levee acts as a barrier to Provo River waters that could potentially inundate properties south of the river, including a nearby manufactured home community.

Riverside Levee Leisure Village (north side of river)

The existing riverside levee Leisure Village (i.e., Leisure levee) is located north of the Provo River from Geneva Road to I-15 and spans 1,224 feet in length. The levee acts as a barrier to Provo River waters that could potentially inundate properties north of the river, which is comprised of the Leisure Village residential community.

2.0 CERTIFICATION REQUIREMENTS AND EXISTING DEFICIENCIES

The project team has performed an assessment of the existing levees to evaluate if portions of the levee system meet the requirements of *44 CFR §65.10 – Mapping of Areas Protected by Levee Systems* and to document any deficiencies that exist. The findings are described in the following sections.

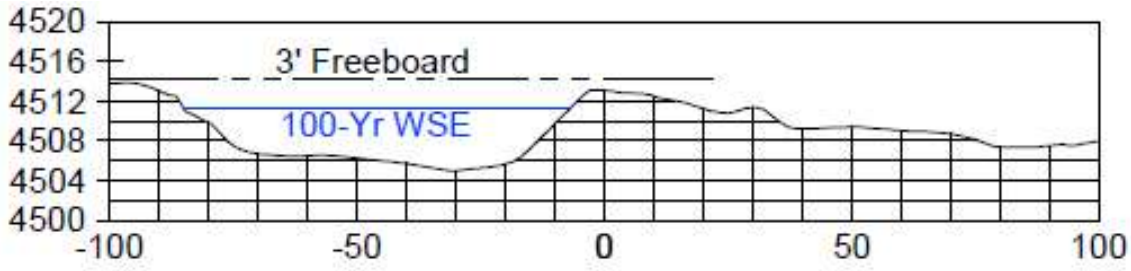
2.1 Freeboard

BACKGROUND AND REQUIREMENTS. Freeboard is a factor of safety that is required to ensure that the desired degree of protection will not be reduced by unaccounted factors such as erratic hydrologic phenomena; future development of urban areas; unforeseen embankment settlement; the accumulation of silt, trash, and debris; and aquatic or other growth in the channels. In general, three feet of freeboard is required above the water surface elevation (WSE) of the regulatory base flood event, which for the Provo levees is the 1%-annual-chance storm event.

EXISTING DEFICIENCIES. The hydraulic analysis of the Provo River was prepared using USACE Hydrologic Engineering Center River Analysis System (HEC-RAS) 1D and 2D computer program. The results of the analysis show that 3,020 lineal feet, or 49% of the length of the north riverside levee does not have adequate freeboard. On the south side, 2,011 lineal feet, or 32% of the total length does not have adequate freeboard. Some areas of deficiency have as little as 0.13 feet of freeboard above the 1%-annual-chance WSE, which means that the levee lacks almost the entire three feet that is required.

The lakeside levee does have adequate freeboard over the 1%-annual-chance lake elevation of 4,498 (elevation is from the effective FIRM). All elevations are presented using the NAVD88 vertical datum. The WSE used in the analysis is based on the regulatory flood event, which is the 1%-annual-chance (100-year) storm event.

Figure 2-1: Cross Section Lacking Required Freeboard, North Riverside Levee



2.2 Closures

Background and Requirements. All openings in the levee, such as storm drain outfalls, must be provided with closure devices that will restrict floodwaters from flowing back through the outfall to the protected landside area when water levels rise on the waterside of the levee. An example of a common closure device set-up for culverts is to have a flap-gate valve or duckbill valve as well as a gate valve that can be manually operated to provide positive closure if the check valve is blocked by debris.



Photo 2-1: Closure device along riverside levee (needs further inspection to determine its functionality), not accessible during flooding event due to its location in the stream channel.

EXISTING DEFICIENCIES. As part of this concept plan, a high-level approach using as-built plans, geographic information system (GIS) data, and field investigation was employed to identify openings in the levees and whether they are equipped with acceptable closure devices. Approximately ten openings were identified, including storm drains and ditches/canals that drain to or are diverted from the river through the levee. None of them were found to have acceptable closure devices in accordance with USACE and FEMA standards.



Photo 2-2: Storm drain outfall along riverside levee with no closure device or proper embankment protection.

2.3 Embankment Protection

Background and Requirements. There are several types of erosion that can affect levees:

- ***Runoff/overtopping**. The slopes of any embankment can become eroded from rain runoff or by embankment overtopping.*
- ***Wave wash**. Under high water conditions, wave action can form long terraces along the length of the embankment slopes. If additional material or bank protection is not provided, the embankment will continue to cave as the waves work their way farther into the slope.*
- ***Channel flow.** These flows can erode a channel bank or levee or undermine other flood control structures and cause them to cave into the water. Bank caving or stream bank erosion can be a very serious threat to the stability of a levee. It is critical that the waterside bank be inspected for bank caving or erosion.*

FEMA requires that engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood. Embankment protection may include riprap or engineered concrete blocks to armor the waterside of the embankment.

EXISTING DEFICIENCIES. Field visits during the summer of 2020 to visually evaluate the existing embankment protection revealed that several locations along the riverside levees have little to no bank protection. Also, there are areas where there is only minor slope protection with broken up slabs of concrete, such as in Photo 2-3.



Photo 2-3: Pieces of broken up concrete once used for embankment protection.

The riverside levees, both north and south, are heavily vegetated with shrubs and trees that have trunk diameters ranging from one-to-two inches up to eight feet diameter with the majority of the large trees being four-to-six feet diameter with integrated root systems within the levee. It is very important to prevent tree growth near levee or channel embankments, because when the roots of these trees decay, they leave pathways or voids in the soil which allow water and soil particles to migrate through the embankment, leading to slope instability. This slope instability due to root penetration has been observed in at least one location. Trees can also be uprooted and deflect flood flows into the embankment, accelerating bank erosion.



Photo 2-4: Embankment protection on lakeside levee.

The lakeside levee does have riprap and what appears to be grouted riprap for slope protection, as shown in Photo 2-4, but the stability and toe-down at several locations along the lakeside are not certifiable per FEMA requirements in *44 CFR §65.10 – Mapping of Areas Protected by Levee Systems*.

2.4 Embankment & Foundation Stability and Settlement

Background and Requirements. FEMA requires that engineering analyses must demonstrate that the levee embankments are adequate regarding stability, seepage, and settlement:

- ***Stability.*** *Levee embankments must be constructed to withstand loading conditions associated with the base flood. Factors that affect the stability of an embankment include the geometry, side slopes, properties of the embankment, foundation materials, and methods of construction.*
- ***Seepage.*** *Seepage into the levee foundation and embankment during loading conditions associated with the base flood must not jeopardize the embankment or foundation.*
- ***Settlement.*** *Over time, an embankment may settle due to embankment loads, compressibility of the soils, age of the levee system, and levee construction. Settlement is a concern in that it reduces the freeboard below the minimum standards.*

EXISTING DEFICIENCIES. Field and laboratory studies were completed by Gerhart Cole in July – August 2020 to collect data for assessing the geotechnical condition of the existing levee system. Studies completed include a field reconnaissance of the alignment, test hole/test pit sampling, cone penetration testing (CPT) soundings, and laboratory testing of both levee and foundation soil materials.

Assessment of Riverside Levees

Consistent with the flooding/emergency response conditions under which the riverside levees were constructed, field data suggests that the levees are generally constructed of relatively coarse-grained materials (gravels and sands, with some cobbles and boulders) apparently taken from the adjacent river channel, possibly together with some imported materials. The in-place densities of these materials are variable, with much of the material considered loose to very loose. This low relative density is observed by low unit weights obtained using the nuclear density gauge, as well as lower than anticipated standard penetration test (SPT) blow counts and dynamic cone penetration (DCP) resistances. Such loose soils inherently present instability issues as well as high erosion and internal "piping" potential. Piping is the underground erosion that occurs when water flows through cavities, cracks, or other underground pathways. The densities of the levee embankment materials appear to be below minimally accepted values for adequately compacted earthwork relative to the nature of the soils involved and current levee section geometries.



Photo 2-5: Test Pit TP-14, Provo River Parkway – East. View of nuclear densometer reading, roots, large cobbles.

A significant number of larger roots have penetrated the levees, which may be just as problematic as the low density (looseness) of the levee embankment materials. Not only has there been at least one documented case of a resulting levee breach; some seepage was observed along tree roots in test pits under non-flooding conditions during site reconnaissance. Consequently, unmaintained vegetation growth has compromised the integrity of the levees such that they no longer provide "reasonable assurance" that the levees will reliably reduce base flood risk. Unfortunately, due to root penetration, simple surface clearing of vegetative growth will not address these existing conditions (although this would help reduce continued degradation).

Based on these observations as well as field and laboratory study results, the existing riverside levees do not satisfy criteria for FEMA accreditation.

Assessment of Lakeside Levee

It should be recognized that significant portions of the lakeside levee were constructed without engineered design criteria, many prior to 1953. According to Provo City, the levee bounding the airport was initially constructed by side-casting of excavated native materials (likely overly wet), being mostly fine-grained silts and clays. The amount of effort subsequently spent to compact these materials is unknown; however, it is unlikely that preparation would meet modern earthwork construction standards.

During flooding in 1983, the USACE implemented a program of "raising and strengthening" existing levee ("dike") sections around the airport (Provo City, 2009). However, as stated in a USACE news release, when control of the levees was given to Provo City, "the levees the Corps [are] turning over to the city should not be thought of as a major flood control project, but as a measure intended only to meet the immediate emergency" (USACE, 1983). Also stated was "[L]ocal authorities now must maintain the protective levees and will ultimately have responsibility for, and the choice of, removing them" (USACE, 1983). Many of these levees were raised again at least three more feet in 1984 (Provo City, 2009). The first statement, together with this suggestion that the City might want to remove the levees, implies that the levees were constructed to a lower standard than what would normally be assumed to provide a minimally acceptable level of reliable service (i.e., permanent flood protection).



Photo 2-6: Test Pit TP-03 (Lakeside)

Beyond qualitative reasoning, field and laboratory data also indicate variable and substandard compaction of the lakeside levee materials. Even portions of the levee constructed most recently in the 1990s as part of the Provo Municipal Airport Runway 13 Dike Construction projects were found to be substandard in materials and compaction methods. Comparison of maximum laboratory densities to those measured in the field frequently indicate a relative compaction of less than 85%, with a value of about 80% being more representative. This degree of compaction is well below accepted minimum values for engineered earthworks such as these earthen embankments.

Based on observations and the results of field and laboratory studies, the existing lakeside levee does not satisfy FEMA accreditation criteria.

2.5 Interior Drainage

Background and Requirements. Interior drainage refers to the stormwater management on the landside (i.e., non-river or non-lake side) of the levee. Stormwater naturally flows towards the river and lake, so when a levee is constructed it acts as a barrier between stormwater runoff and the receiving water body. Proper care must be taken to manage the interior drainage and allow it to flow over, through or around the levee so that a flood risk is not created on the landside of the levee.

Additionally, serious damage to levees can be caused by inadequately designed or constructed pipelines, utility conduits, or culverts beneath or within levees. Each pipe crossing should be evaluated for its potential damage which would negatively impact the integrity of the levee system and could ultimately lead to catastrophic failure. During high water, seepage tends to concentrate along the outer surface of pipes resulting in piping of fill or foundation material.

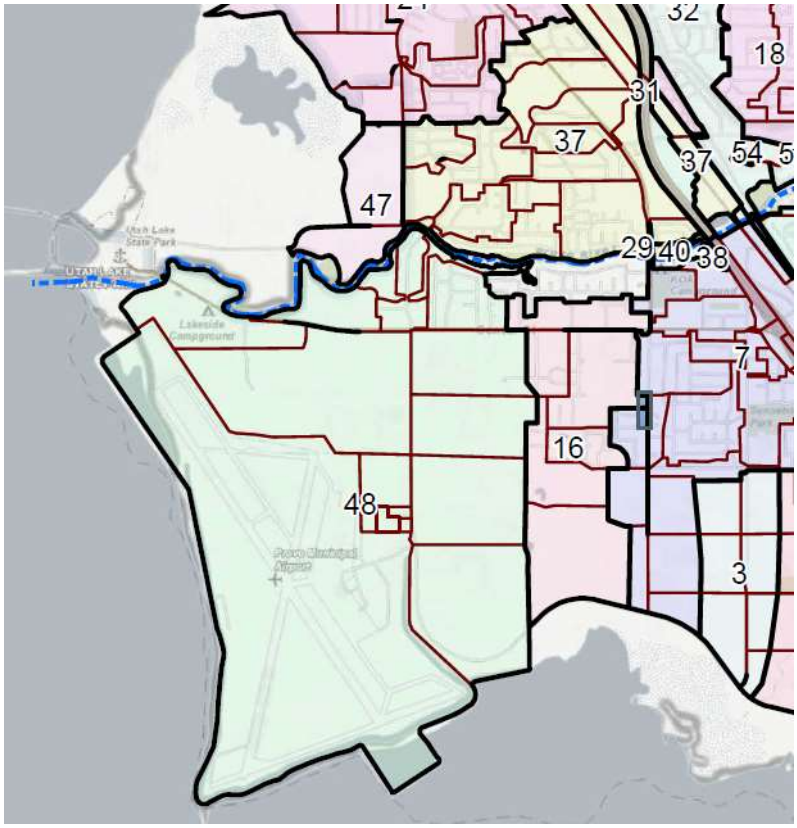
EXISTING DEFICIENCIES. The current interior drainage system may not be adequate for today's 1%-annual-chance flood design criteria. Four major areas have been identified in Table 2-1 that drain toward the levees:

Table 2-1: Interior Drainage Summary

Subbasin	Drainage Area	Estimated Peak Discharge 1%-Annual-Chance Event	Adequacy of Conveyance
Lakeshore (north of river)	160 acres	30 cubic feet per second (cfs)	Conveyed via irrigation canal of unknown capacity that parallels the river and then is piped under Lakeshore Drive in a 24" diameter pipe; capacity of conveyance may be inadequate and may need to be relocated to accommodate levee reconstruction
Riverview (south of river)	83 acres	20 cfs	Pumped over the levee into the river via Riverview Pump Station, maximum pumping capacity about 11 cfs; pump station may need to be relocated to accommodate levee reconstruction
Leisure Village (north of river)	Five acres	2 cfs	Drainage from this area currently flows into a sump with no apparent outlet; needs a small pump station to convey drainage over levee
Airport (lakeside)	1,715 acres	200 cfs	Flows through "moat," which provides detention, to Airport Pump Station, maximum pumping capacity about 28 cfs; moat may need to be piped to provide embankment stability for levee; pump station may not be adequate once moat detention area is reduced

Figure 2-2 shows the interior drainage areas.

Figure 2-2: Interior Drainage Areas



Legend:

Subbasin	Drainage Basin ID
Lakeshore	37
Riverview	29
Leisure Village	40
Airport	48

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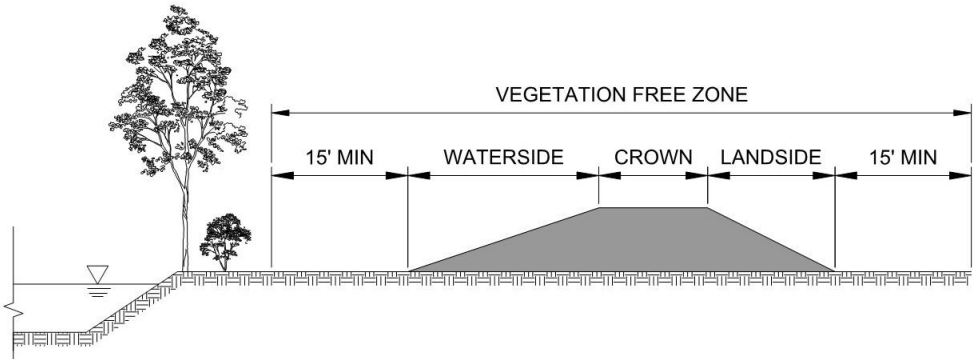
Provo City Storm Drain Master Plan, Bowen Collins & Associates, January 2019

2.6 Vegetation Management

Background and Requirements. A vegetation-free zone must be maintained around the levee to preserve its structural integrity from root intrusion and to ensure adequate access for activities that include inspection, maintenance, and flood-fighting operations. In general, no woody vegetation may be allowed in the vegetation-free zone other than grasses and forbs. The vegetation-free zone includes the crown, side slopes and 15 feet beyond the toe on either side of the levee, as depicted in Figure 2-3. A regular maintenance program is required to maintain the vegetation free zone.

EXISTING DEFICIENCIES.

Figure 2-3: USACE Vegetation Free-Zone on Levee Section



Riverside Levees

The riverside levees closely parallel the banks of the lower Provo River, except for approximately 1,100 feet of the KOA levee which is set back approximately 200 feet to the south farther away from the river channel. The existing riverside levees are covered with hundreds of deep-rooted trees and shrubs on both sides of the embankment. Photo 2-7 and Photo 2-8 are shown as examples of existing vegetation on the riverside levees. Trees and shrubs are especially dense along the toe-of-slope near the "normal" (i.e., non-flood) water levels. Existing tree and shrub species on the riverside levees include native box elder, rubber rabbitbrush, Fremont and eastern cottonwood, coyote, peachleaf and yellow willow, and red osier dogwood, however they are dominated by non-native and invasive Siberian elm, crack willow, silver poplar, tree of heaven, Russian olive, and tamarisk. There are more non-native invasive trees than there are native trees.



Photo 2-7: Existing vegetation on south riverside levee upstream of Lakeshore Drive.

Vegetation management (clearing) has occurred to maintain access on the top of the existing levees, but very little proactive clearing has occurred along the levee side-slopes and toe-of-slope since they were constructed in the 1980s. Ground cover in the form of grasses and forbs is present but sparse because of shading and competition from the mature trees and shrubs.



Photo 2-8: Existing vegetation on north riverside levee upstream of Lakeshore Drive.

The entire lower Provo River within the project area is designated as critical habitat for the threatened (recently down-listed from endangered) June sucker, therefore vegetation clearing along the streambanks has been discouraged by State and Federal agencies since the 1980s to maintain suitable habitat conditions. Streamside vegetation and a healthy riparian ecosystem play a role in maintaining suitable spawning habitat for June sucker and other fish that use the lower Provo River. More than 90% of the spawning June sucker from Utah Lake use the lower Provo River between April and July, during the period when they stage,

spawn, and return to Utah Lake annually. Yellow-billed cuckoo were recently added as a threatened species on the Endangered Species List and have been observed historically in the riparian areas along the lower Provo River, but are uncommon currently. These birds are more commonly observed in the middle Provo River where the riparian ecosystem is much wider and diverse, with multiple canopies of trees and shrubs.

Lakeside Levee

Portions of the lakeside levee are also covered with native and non-native trees and shrubs, but most of the lakeside levee length is void of woody vegetation, and the side-slopes are mostly covered in grasses, forbs, and riprap with occasional heavy patches of trees and shrubs. Non-native invasive tamarisk and Russian olive trees are common along the existing airport levee side slopes. Photo 2-9 and Photo 2-10 are shown as examples of existing vegetation on the lakeside levee. Since the lakeside levee embankment mostly extends into standing water on both sides, the toe-of-slope is dominated by emergent wetland species such as native bulrush, but more common is the non-native invasive phragmites. Phragmites is an invasive noxious weed and became dominant around Utah Lake and the Great Salt Lake in the 1990s and has since replaced most native emergent wetland species. Higher infrequently inundated lakeside benches exist adjacent to the levee in places and have native and non-native trees and shrubs. The top of the levee is maintained for access, but the shoulders of the road are lined with deep-rooted drought resistant rubber rabbitbrush and sagebrush.



Photo 2-9: Existing vegetation on lakeside levee north of Provo Airport.



Photo 2-10: Existing vegetation on lakeside levee west of Provo Airport.

2.7 Right-of-Way and Encroachments

Background and Requirements. To maintain and control the integrity of the levee system, it is imperative that Provo City own or have easements on the land on which the levee is situated. This allows for the City to maintain the vegetation-free zone, to protect the levee from encroachments that may damage or disrupt the functioning of the levee system, and to have access to the levee during flood-control operations.

EXISTING DEFICIENCIES. Provo City does not own all the land that the riverside levees currently occupy. The levee embankments on the north and south sides of the river extend into 49 different parcels that are not owned by the City, primarily along the south riverside levee. The City would need to acquire approximately 3.8 acres across these 49 parcels to have ownership of the full levee embankment. Refer to Appendix B for maps that depict these parcels.

2.8 Summary/Determination of Deficiencies

Table 2-2 summarizes the findings that have been presented in Section 2.0. Both the riverside and lakeside levees contain many deficiencies that render the levees not certifiable in their current state. The levees may appear to be functioning adequately, but they do not currently meet FEMA criteria for certification.

Table 2-2: Summary of Levee Deficiencies

Category	Riverside Levees	Lakeside Levee
Freeboard	✗ 49% of the north levee and 32% of the south levee length has less than three feet of freeboard	✓ Freeboard is sufficient
Closures	✗ No levee penetrations had proper closure devices	✗ No levee penetrations had proper closure devices
Embankment Protection	✗ Little to no bank protection	✗ Rip rap not keyed in properly
Embankment Stability	✗ Undocumented/poorly compacted embankment materials, vegetation /root penetration	✗ Undocumented/poorly compacted embankment materials, vegetation /root penetration
Interior Drainage	✗ Leisure Village area has no outlet; Riverview pump station may not have sufficient capacity for 1%-annual-chance storm;	✗ Airport pump station may not have sufficient capacity for 1%-annual-chance storm
Vegetation Management	✗ Heavy vegetation including large trees found in vegetation-free zone	✗ Top has been maintained; side slopes have deep-rooted brush
Right-of-way and Encroachments	✗ The levees occupy 3.8 acres of land on 49 different parcels that are not owned by the City	✓ The City has ownership of the levee and adjacent airport property

3.0 LEVEE REHABILITATION PROJECT OBJECTIVES

As concluded in the previous section, the existing levees are not certifiable in their present condition. Thus, FEMA's next map revision will be made using the assumption that the levees do not provide flood protection. To avoid the surrounding area being reclassified as a floodplain and to provide protection from flood damage, Provo City will need to rehabilitate or rebuild the levees to meet the FEMA requirements of *44 CFR §65.10 – Mapping of Areas Protected by Levee Systems*. This will be a major undertaking, and the following objectives should be considered in the planning and design of such a project.

3.1 Flood Risk Protection

The primary goal of the project is to provide a FEMA certifiable levee system that will protect this area of Provo City from flood damage. The levee system will need to meet the requirements of freeboard, positive closure devices, embankment protection, embankment and foundation stability, and interior drainage that were discussed in the previous section. Once the new levee system is constructed, it is required that the City follow an Operation and Maintenance Plan, of which vegetation maintenance is a key component, to protect the integrity of the levee from root intrusion. The City will need to have property ownership or easements for the entire levee system to control and maintain it as required by FEMA.

3.2 Environmental

A key consideration in this project is the environmental impact. The project area contains habitat for threatened and endangered species, including June sucker, Yellow-billed cuckoo, and Ute ladies'-tresses. A Clean Water Act Section 404 Permit will be necessary, and it is expected that the permitting process may be extensive and drive the schedule of the entire project. Permitting will require justification for any wetlands impacted, how the impact to the wetlands will be minimized, and a proposal to provide compensatory mitigation for unavoidable impacts.

The feasibility of permitting will improve if the project seeks to reduce impacts to the wetlands and the habitat threatened and endangered species through river restoration.

3.3 Beneficial Use/Recreation

The Provo River Parkway Trail follows the Provo River for 30 miles from Provo Canyon all the way to Utah Lake. In the project area, it runs along the north riverside levee with two access points – a trailhead near Geneva Road and the other at Lakeshore Drive. The trail is paved and used heavily by cyclists, joggers, and other recreators. Its aesthetic appeal is enhanced by the very native and non-native trees that threaten the structural integrity of the levee system. This recreational amenity is highly important to the community, and a levee rehabilitation project will need to consider during-construction and permanent impacts to this trail and seek to retain its natural aesthetics and recreational characteristics.



Photo 3-2: Provo River Parkway Trail

3.4 Minimization of Property Acquisition

As mentioned in Section 2.7 , there are areas of the current levee which are outside of the City's ownership. Provo City would need to pursue property acquisition to acquire ownership or easements of the property that the levee currently occupies.

Neighborhoods along the lower Provo River encroach into the natural floodplain and restrict the river into a relatively narrow corridor between the levees. To gain enough space for certifiable-sized levee embankments, maintenance access, and restoration of the habitat for the threatened June sucker in the river channel, property acquisition of additional homes/lots and partial acquisition of backyards may be necessary. The City will need to balance the flood protection, environmental, and other various needs of the project with property acquisition in selecting the most appropriate path forward for the community. Governmental action to acquire property for flood and environmental needs takes time, following specific regulatory (federal, state and city) acquisition processes and procedures to comply with various funding requirements planned for a project of this type.

3.5 Cost

The cost of the levee project will likely be significant for Provo City, and will certainly be a factor in selecting the appropriate design solution as any project(s) moves forward. Project funding resources are discussed in *Section 9.0 – Funding Resources*.

4.0 PROPOSED LEVEE CROSS SECTION

4.1 Selection of Levee Construction Type

After the team performed the initial assessment of the levee system as presented in Section 2.0 and became aware of its current state and deficiencies, a wide range of levee embankment types were considered as rehabilitation/replacement options. A complete summary of each of these embankment and floodwall types and the advantages/benefits and challenges/risks of each is given in Appendix A. Table 4-1 gives a summary of the options for both the riverside and lakeside levees.

Table 4-1: Levee Construction Types

No.	Alternative Name	Brief Description
1	Sheet Piles	Long steel structural sections with a vertical interlocking system that create a continuous wall driven by vibratory pile hammers.
2	Secant Pile/Deep Soil Mixing	Drilled concrete structural sections either constructed with concrete and structural reinforcing steel or cement amended soil. Drilled sections are overlapped to form a continuous wall section.
3	Excavated/Trenched Cutoff Wall (soil amended/cement bentonite)	Levee embankment and foundation materials are improved through the construction (excavation/trench) of a soil-amended (soil bentonite) or cement (cement bentonite) cutoff wall.
4	Inverted T-Walls/Flood Walls	Construction of a reinforced concrete cutoff wall through levee embankments.
5	Box Culverts*	Directing channel through a series of consecutive concrete box culverts.
6	Levee Reconstruction (existing locations)	Replace in place with accredited earthen levee embankments.
7	Setback Levees (realignment)	Relocation and construction of new accredited earthen levee embankments.

*Please note that box culverts were not considered for lakeside levees.

Each levee construction type was considered with respect to the following criteria:

- Reasonable assurance/maintenance/reliability
- Groundwater control
- Impact to vegetation
- Freeboard
- Trail accessibility
- Construction risks and challenges
- Contractor availability
- Relative construction cost

MOST FAVORABLE LEVEE CONSTRUCTION TYPES:

- Earthen embankment, replaced in place
- Earthen embankment, set back from existing levee
- Inverted T-wall, in some specific locations

From this initial assessment, it has been determined that due to cost considerations, environmental impacts, and constructability, that the best option is a traditional earthen embankment, constructed either in-situ or relocated behind the existing levee (options 6 and 7 from Table 4-1 above). Refer to Appendix A for additional information.

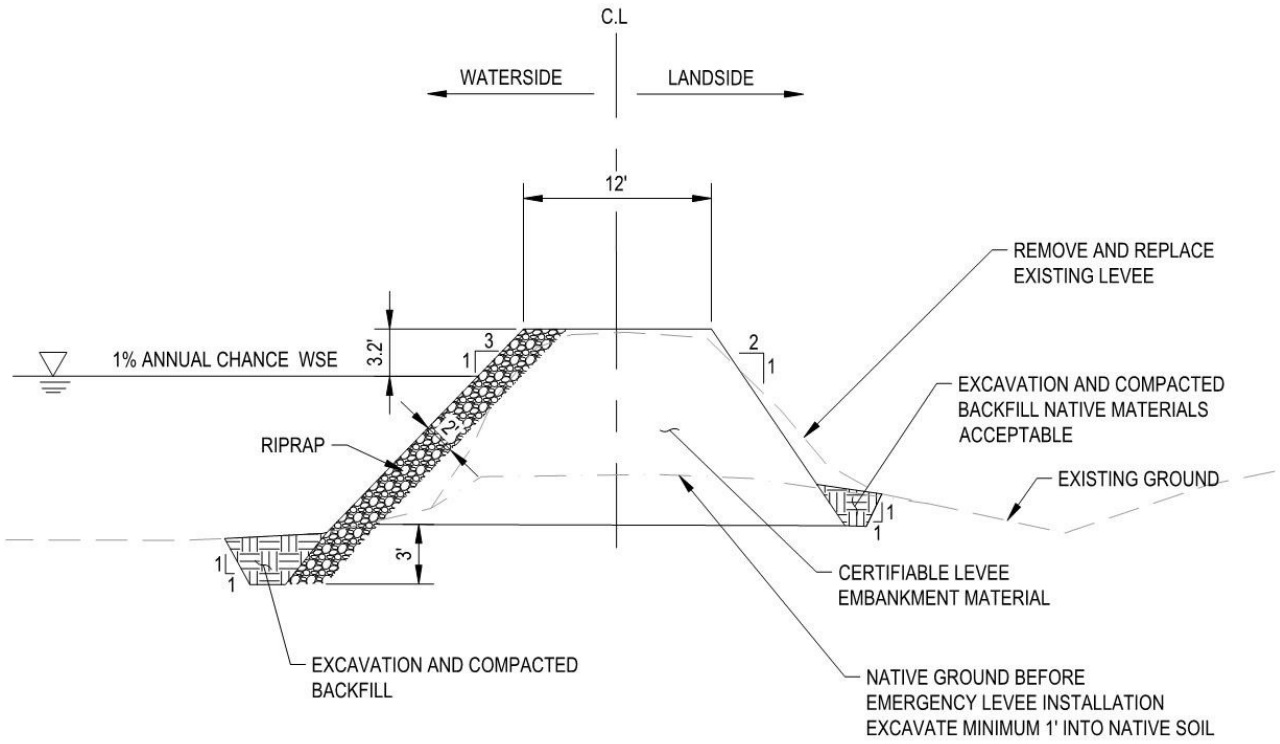
In some very specific cases, an inverted T-wall (option 4 from Table 4-1 above) may be a viable option. In places along the levee alignment where the landside ground surface is high (close to the 1%-annual-chance Water Surface Elevation [WSE]) and excavation below the stream bed would not be necessary, and the risk of settlements

are low, a relatively short, inverted T-wall becomes constructable and more cost effective. This is an alternative to an earthen embankment in areas along the alignment where it is desirable to reduce the width of the levee cross section to leave more space for river restoration.

4.2 Earthen Embankment Cross Section

A proposed certifiable embankment cross section has been developed. The landside side slope is 2:1 and the waterside side slope is 3:1. The height will be set at a minimum of three feet of freeboard above the 1%-annual-chance WSE and thus will vary based on the terrain. The crest is recommended to be 12 feet wide, based on the minimum width needed for levee operation and maintenance. Figure 4-1 is a typical embankment cross section that is recommended.

Figure 4-1: Recommended Typical Embankment Cross Section



4.3 Embankment Stability, Seepage and Settlement Analyses

Gerhart Cole has performed embankment stability, seepage, and settlement analyses for the proposed cross section. This analysis is briefly summarized as follows and is presented in detail in a separate technical memorandum titled, "Provo City West Side Levees Geotechnical Engineering Evaluation," dated December 11, 2020.

Since the height and width of the levees vary depending on the terrain, the highest possible cross section has been analyzed, which would occur at a point along the lakeside levee. This cross section has a maximum lakeside height of 13 feet. The analysis also assumes that all previous levee materials (1983 or earlier) are removed and replaced with fill material that has low permeability and is highly compactible to meet FEMA stability requirements. The section is founded on different idealized foundation soils believed to be generally representative of the range of subsurface conditions present.

Minimum acceptable factors of safety with respect to slope stability (landside and waterside) were generally obtained for 1) long term conditions, with the channel being full (water levels for 1%-annual-chance flood), 2) end of construction conditions, where stability may potentially be controlled by undrained consolidated behavior of clayey soils, prior to use of the levee, and 3) rapid drawdown conditions. The moat along the lakeside levee would need to be filled with earthen material to obtain acceptable factors of safety for the lakeside levee.

With respect to seepage analyses, maximum exit gradients were calculated as being below target values, thereby indicating minimal risk of internal erosion and piping of soils.

In addition to seepage and slope stability analyses, settlement analyses were performed to estimate potential amounts of settlement stemming from placement and construction of embankments. Experienced settlement will vary greatly depending upon the amount of clay (and the degree of over-consolidation of that clay) relative to the amount of sand/gravel in the profile, as well as whether the ground has been settled due to preloading (as would be the case of an embankment being built over ground previously occupied by an embankment, the previous embankment having been removed due to structural deficiencies). For the same embankment section used in the slope stability and seepage evaluations, founded on previously level ground or clear (virgin) subgrade consisting primarily of clay, calculated settlements are on the order of eight inches to two feet within the first year or two, with an additional four to six inches over the next 50 years. If two feet of peat like that are found in one of the test holes (20-TH-03), an additional short-term settlement of two to six inches might be expected without additional geotechnical treatments. It should be noted however, that the occurrence, thickness, and properties of peat are expected to vary. In contrast, if the subgrade is primarily sand, embankment settlement is calculated to be about two to three inches with no substantial long-term creep.

Settlement of the embankment reduces the height of the embankment and thus the amount of freeboard over the 1%-annual-chance-storm WSE. There are several options to mitigate settlement, including constructing the levee a few inches higher to offset expected settlement or pre-loading the levee area with an over-burden to cause the settlement to occur prior to final construction. An advantage to an earthen embankment is that additional material may be added to the crown of the levee during regular maintenance,

5.0 ALIGNMENT ALTERNATIVES

5.1 Overview

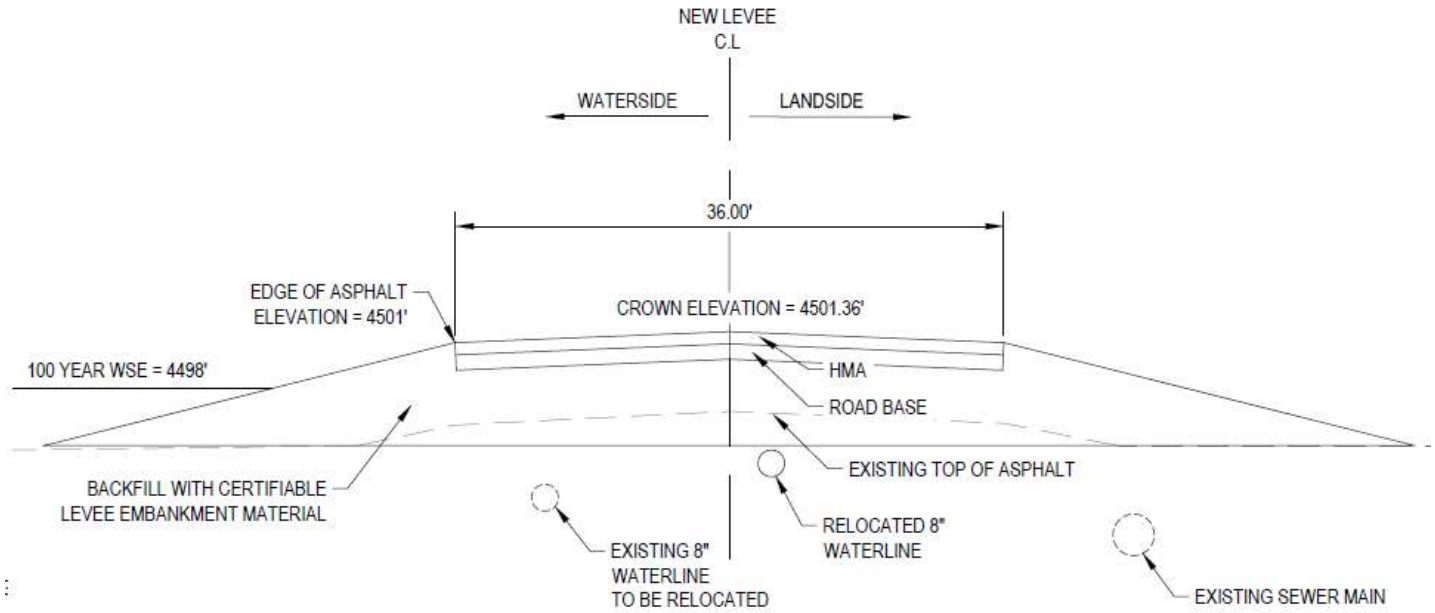
Three alignment alternatives for replacing the existing levee systems were considered as part of this project. The alternatives are identified as 1, 2A, and 2B. Each alternative is comprised of segments of levee reconstruction in-place or setback levees, with selective use of the inverted T-wall:

- **Segments with Alternate Proposed Alignments**. In developing the alternatives, the existing riverside south and north levees were adjusted to consider varying hydraulic performance of the river and related flooding elevations that affect the size and location of these levees. The riverside south levee was analyzed in its existing footprint (Alt 1 south) and the adjusted version that is setback further south from the existing riverside south levee (Alt 2 south). The riverside north levee was analyzed in its existing footprint (Alt 1 north) and two versions that are set setback further north from the existing riverside north levee (Alt 2A north and Alt 2B north).

- **Segments with a Single Proposed Alignment.** The KOA levee, Leisure levee and lakeside levee are proposed to be replaced in place and are generally the same in each of the three proposed alternatives.

  The lower river – west segment is proposed to be set back to Center Street and is the same for each of the alternatives. The existing levee and surrounding vegetation would be left in place and Center Street would be raised and reconstructed. The north side (waterside) of the street would act as a levee and be built to FEMA requirements of *44 CFR §65.10 – Mapping of Areas Protected by Levee Systems*, with utilities relocated to the south side of the street. Figure 5-1 depicts the cross section of the proposed Center Street levee.

Figure 5-1: Center Street Levee Cross Section



- **Segment Not to Be Rehabilitated**. No recommendations for improvements are made for the lower river – east segment, due to the anticipated developments in this area which have proposed to raise the finished grade above the flood elevation.

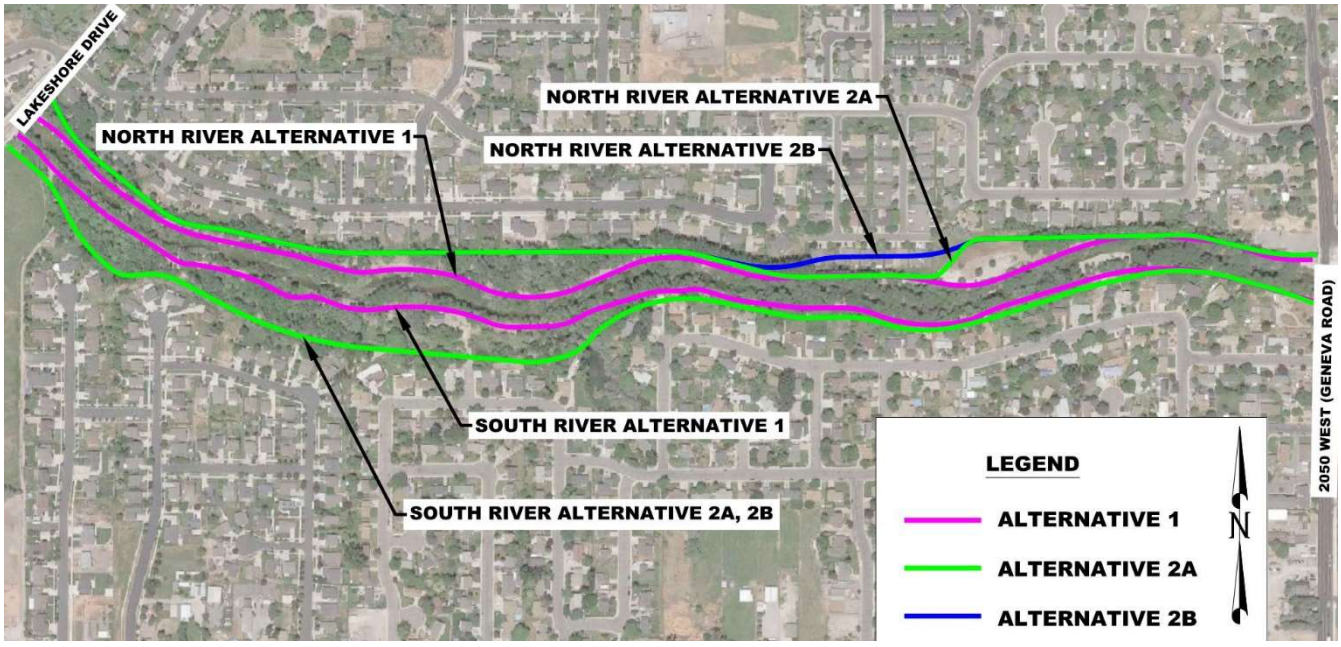
Refer to Appendix C for Levee Alternative Plans. Table 5-1 describes the segments that comprise each alternative.

Table 5-1: Segments Comprising Each Alternative

Levee Segment	Alternative 1: Replace Levees in Place	Alternative 2A: Setback Levees	Alternative 2B: Setback Levees
Lakeside	*Replace in situ*	*Replace in situ*	*Replace in situ*
Lower River - West	*Levee set back to Center Street*	*Levee set back to Center Street*	*Levee set back to Center Street*
Lower River - East	*No levee rehabilitation – development proposals will raise grade*	*No levee rehabilitation – development proposals will raise grade*	*No levee rehabilitation – development proposals will raise grade*
Riverside South	*Alt 1 South Replace in situ*	*Alt 2 South (set back to the south)*	*Alt 2 South (set back to the south)*
Riverside North	*Alt 1 North Replace in situ*	*Alt 2A North (set back to the north)*	*Alt 2B North (set back to the north)*
Leisure (north)	*T-wall in situ*	*T-wall in situ*	*T-wall in situ*
KOA (south)	*Replace in situ*	*Replace in situ*	*Replace in situ*

Figure 5-2 shows the segment of riverside levees between Lakeshore Drive and Geneva Road, which is the only segment in which the three alternatives differ from each other.

Figure 5-2: Three Alignment Alternatives – Segment Between Lakeshore Dr. and Geneva Road



River Hydraulics

CRS has obtained the FEMA hydraulic model (USACE HEC-RAS) and has updated that model for the reach between I-15 and Lakeshore Drive with the three different alternative scenarios. Alternative 1 shows an increase in WSE from existing conditions. Alternatives 2A and 2B show a reduced WSE from existing conditions. All three alternatives pass through the bridge at Lakeshore Drive with adequate freeboard.

The overall purpose of studying the river hydraulics at this juncture of the project is to determine the required levee height, which is defined by the 1%-annual-chance WSE plus the required three feet of freeboard. The levee height governs the amount of material needed to construct the embankment and thus the cost of the levee, as well as the horizontal space needed for the levee (since the higher the levee, the wider the footprint of the levee). The outcomes of the hydraulics analysis (levee height, embankment material quantity, embankment footprint) have been accounted for in the cost estimate and property acquisition analysis.

5.2 Alternative 1

Alternative 1 consists of complete removal of existing, non-certifiable levees and installation of new levees in the same location. The existing trail and existing vegetation (including trees) will be removed as part of construction. The trail will be rebuilt on the north levee. Limited property acquisition is anticipated as part of this alternative.

Environmental/River Restoration/Vegetation Management

Alternative 1 essentially replaces the existing levee in the same location adjacent to the river channel; however, the footprint of the levee would increase due to the FEMA requirements for flood control levees in *44 CFR §65.10 – Mapping of Areas Protected by Levee Systems*. All trees and shrubs would be eliminated on and within 15 feet of the new levee. Vegetation on the levees would be limited to relatively shallow-rooted grasses and forbs. Channel re-alignment and floodplain/riparian vegetation restoration would be possible under this and all other alternatives in the KOA/Leisure reach for approximately 1,100 feet in length and approximately 200 feet in width between I-15 and Geneva Road. This restoration would provide improvements to the riverine ecosystem and improved access to the river for public uses. Some existing trees in this reach might be able to be avoided, but most existing trees would need to be removed to allow for channel and floodplain restoration within the newly constructed FEMA accredited levees.

River restoration opportunities under Alternative 1 west of Geneva Road would be limited to the existing channel footprint or less, making it exceedingly difficult to include measures focused on enhancement of aquatic and riparian habitats in this reach. Additionally, to maintain stability of the toe-of-slope, streamside vegetation would be virtually eliminated west of Geneva Road under this alternative. Therefore, Alternative 1 would destroy much of the existing habitat and shading values provided by riparian vegetation along the riverbanks within a reach designated as critical habitat for the threatened June sucker. Spawning habitat would be degraded unless extraordinary measures were taken to construct and maintain pool/riffle sequencing important for June sucker spawning. Large woody vegetation in and near the river channel is useful in maintaining this natural form.

Trail/Public Access

The existing trail and public access will be disrupted throughout the construction process. Reasonable safety precautions will likely lead to complete closure of the trail until after construction is completed. As part of the construction of the replacement levee, the trail is anticipated to be restored and be available for continued use by the public. The nature of the trail will be altered based on changes in vegetation. Due to tree removal and replacement by grasses and forbs, the trail will not be well-shaded as it now exists.

5.3 Alternative 2A

Alternative 2A consists of new levees along the north and south sides of the river set back from (or "outside") of the existing levees. The existing levees will remain in-place with modifications to allow for river flows to move outside of the existing levee system yet still be contained by the new levee system. The existing trail and vegetation will largely remain in place or be replaced once construction is completed. Property acquisition of partial and full properties is anticipated as part of this alternative.

Environmental/River Restoration/Vegetation Management

Alternative 2A is the same as Alternative 1 in the KOA/Leisure reach and is similar to Alternative 1 for approximately 500 feet just west of Geneva Road, but provides considerably more space for riverine processes and functions for the next 1,000 feet, constricts again similar to Alternative 1 for another 1,000 feet, and then expands with levees set back away from the river channel for the next 2,300 feet upstream from Lakeshore Drive. In total, approximately 30 percent of the reach between Geneva Road and Lakeshore Drive under Alternative 2A would be impacted similar to Alternative 1 with tree-free FEMA accredited levees adjacent to Provo River, but those impacts would be avoided, and restoration potential would exist for 70 percent of the channel length in this important reach for the

June sucker. All trees and shrubs would be eliminated on and within 15 feet of the new FEMA accredited levee, yet this configuration provides more space for the river and riparian vegetation adjacent to the river, which is one of several important factors for river restoration that are discussed in more detail below. In summary, Alternative 2A avoids some of the significant impacts to June sucker habitat described for Alternative 1 by setting portions of the newly constructed FEMA accredited levees back away from the river and avoids impacting existing riverside vegetation along most of this reach.

Trail/Public Access

Although the existing trail will remain largely in place along the existing north levee, it will be breached in several locations to allow for water to flow outside of the existing levees yet still be contained by the new levees. In areas where breaches occur, the trail will be modified with geometry changes (sloped to river level and then back to trail level), modified via pipelines underneath the trail, modified by pedestrian bridge, or other similar solutions.

The existing trail is shaded by a combination of native and non-native trees and is used extensively and valued by the public in addition to providing habitat to a variety of fish and wildlife species. For example, the existing vegetation structure has multiple canopies in places and provides potential habitat for the threatened Yellow-billed cuckoo. Alternative 2A includes selective removal of non-native invasive trees and allow for replacement and habitat enhancement via seeding and planting strategies to improve habitats through revegetation and weed control toward a more native riparian vegetation community. This alternative will not only provide for continued trail shading and better access to the river for the public in some sections, but will also provide opportunities to improve riparian conditions and the riverine ecosystem that are important for June sucker and Yellow-billed cuckoo habitats.

5.4 Alternative 2B

General Description

Alternative 2B is very similar to Alternative 2A, with the only difference in alignment being a stretch along the north side of the river from approximately 2330 West to 2460 West, in which it is proposed that the levee be set back even further to allow more space for river and floodplain restoration. To gain this additional space, the acquisition of 10 full properties located on 390 North would be required. The existing levees will essentially remain in-place, with modifications to allow for river flows to move outside of the existing levee system yet still be contained by the new levee system. The existing trail and vegetation will largely remain in place.

Environmental/River Restoration/Vegetation Management

The important factors for restoration discussed previously for Alternative 2A are also applicable to Alternative 2B, which simply includes a larger area for restoration activities when compared to Alternative 2A, as can be seen in Figure 5-2 on page 30. The expanded north levee set back allows for a 500 feet shorter constriction in the middle of the reach between Geneva Road and Lakeshore Drive, essentially providing impact avoidance for 10 percent more channel length in critical June sucker habitat compared to Alternative 2A. All trees and shrubs would be eliminated on and within 15 feet of the new levee, but more space between the levee and river for a longer distance would allow for riparian vegetation communities necessary to maintain and possibly improve critical June sucker habitat. The added space on the north side of the river means that additional ecosystem benefits can be realized for both June sucker and Yellow-billed cuckoo in this reach, and greater inclusion of riverine processes and riparian habitat can be incorporated into detailed designs. Of the alternatives considered, Alternative 2B clearly offers the most potential for benefits from restoration efforts while implementing vegetation management necessary for levee protection.

Trail/Public Access

Although the existing trail will remain largely in place along the existing north levee, it will be breached in several locations to allow for water to flow outside of the existing levees yet still be contained by the new levees. In areas where breaches occur, the trail will be modified with geometry changes (sloped to river level and then back to trail level), modified via pipelines underneath the trail, modified by pedestrian bridge, or other similar solution.

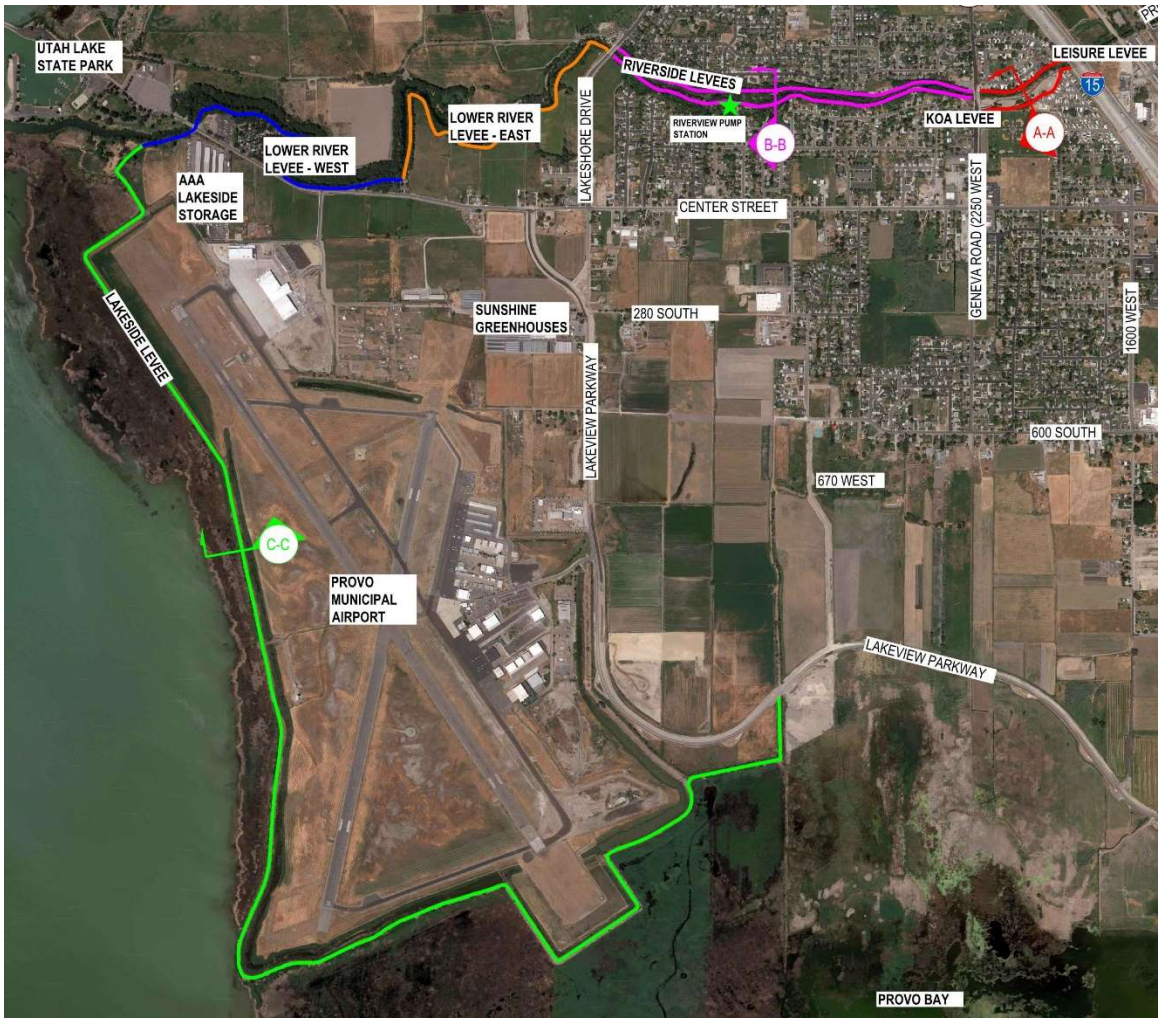
Alternative 2B is like 2A, but with approximately 10 percent more opportunities for selective removal and replacement of non-native invasive trees, and habitat enhancement via seeding and planting strategies to improve habitats through revegetation and weed control toward a more native riparian vegetation community.

This alternative will not only provide for continued trail shading and better access to the river for the public but provides more opportunities to improve riparian conditions and the riverine ecosystem that are important for June sucker and Yellow-billed cuckoo habitats.

5.5 Existing and Proposed Cross Sections

Cross section depictions of the existing and proposed conditions at three locations are presented on the three pages that follow. These cross sections are conceptual and have been included with the intent of showing the possibilities for each of the proposed alternatives.

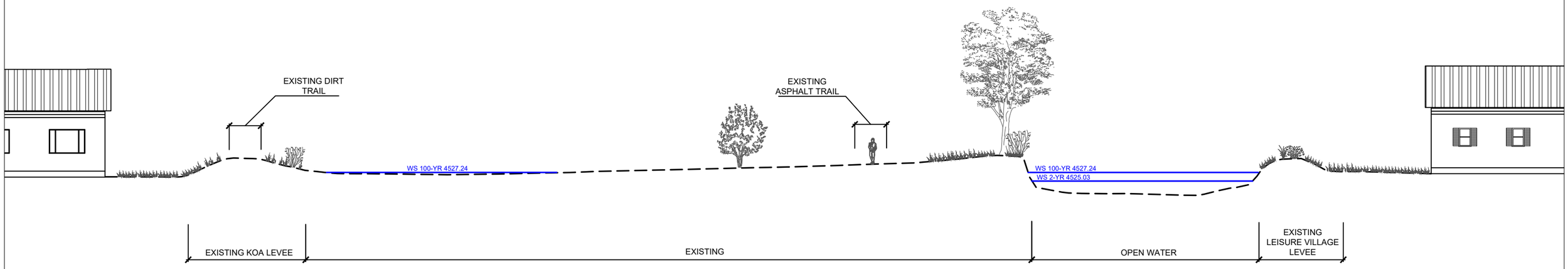
Figure 5-3: Conceptual Cross-Section Location Map



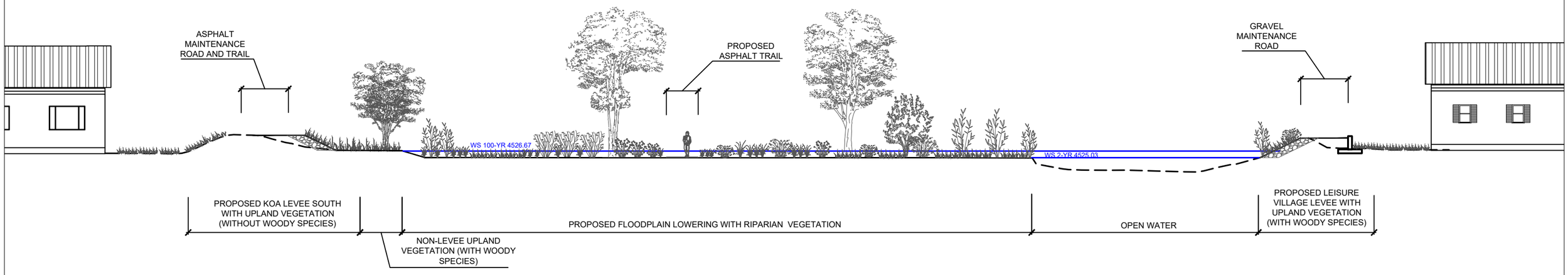
The cross sections are described as follows:

- **Figure 5-4: Section A-A Geneva Road to I-15** (Leisure/KOA levees). Two cross sections are shown – one for existing conditions and the other for the proposed alignment (which is the same for all three alternatives in this stretch of the river). For the proposed trail along the KOA levee, a secondary trail option above the 100-year floodplain will be the access road on the levee during periods of high-water levels. Temporary or permanent connections between the trail and the access road will be established.
- **Figure 5-5: Section B-B Lakeshore Drive to Geneva Road** (riverside north and south levees). Three cross sections are shown – existing conditions, Alternative 1, and Alternative 2A/2B.
- **Figure 5-6: Section C-C Lakeside Levee**. Two cross sections are shown – one for existing conditions and the other for proposed conditions (which is the same for all three alternatives).

Figure 5-4: Conceptual Cross Sections: A-A Geneva Road to I-15 (Looking Downstream/West)

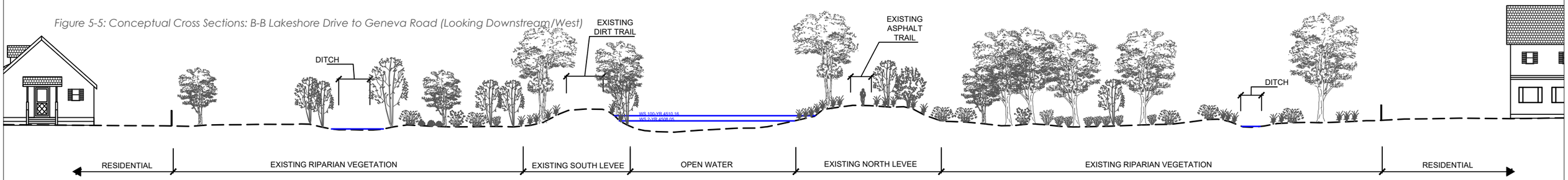


CP106 EXISTING CONDITIONS CROSS SECTION

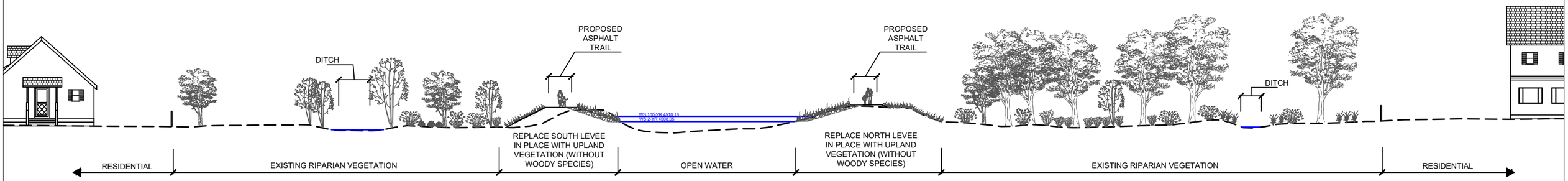


CP106 PROPOSED LEVEE CROSS SECTION

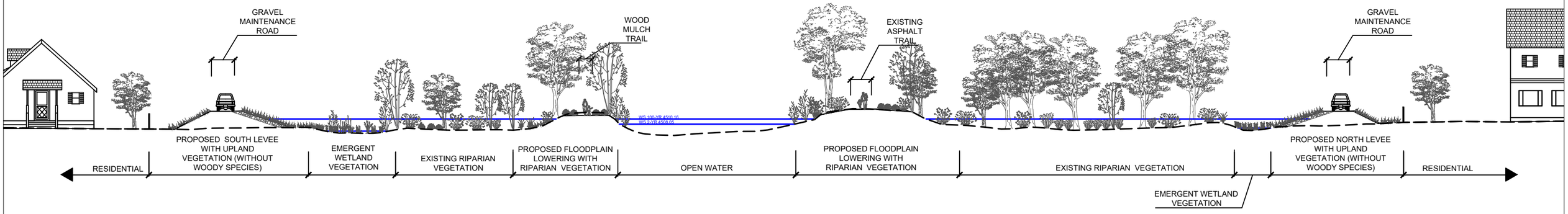
Figure 5-5: Conceptual Cross Sections: B-B Lakeshore Drive to Geneva Road (Looking Downstream/West)



CP103 EXISTING CONDITIONS CROSS SECTION

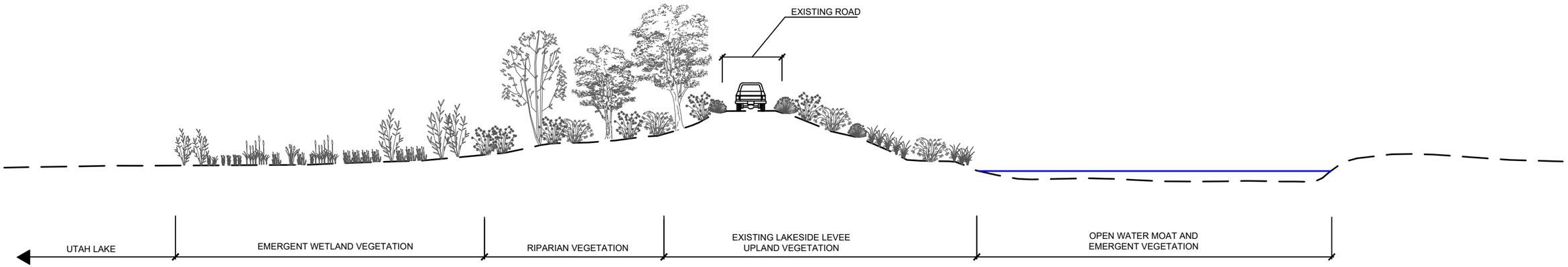


CP103 PROPOSED LEVEE A1 CROSS SECTION

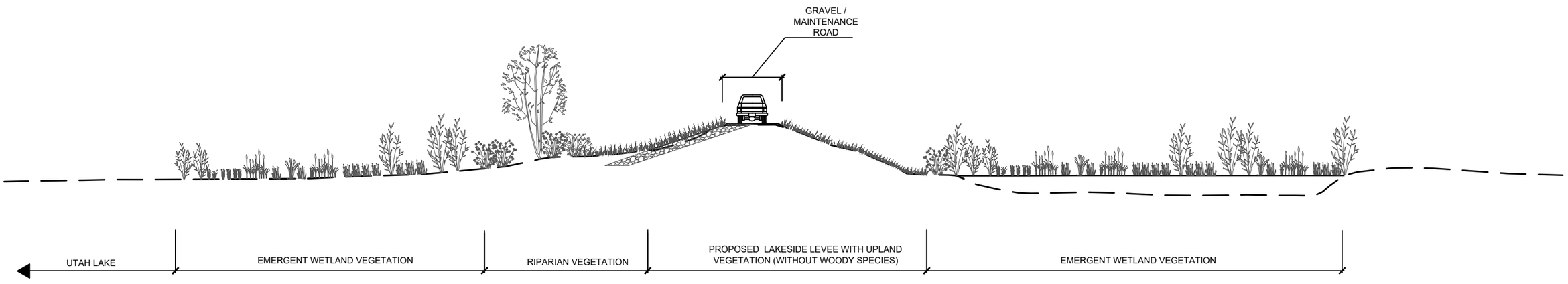


CP103 PROPOSED LEVEE A2A/A2B CROSS SECTION

Figure 5-6: Conceptual Cross Sections of C-C Lakeside Levee (Looking North)



LAKESIDE LEVEE EXISTING CONDITIONS CROSS SECTION



LAKESIDE LEVEE PROPOSED CONDITIONS CROSS SECTION

6.0 BENEFIT-COST ANALYSIS

The feasibility of implementing a levee improvement project requires understanding the cost and benefit of the project to help the City and its stakeholders make important decisions. Using a Benefit-Cost Analysis (BCA) can help identify the highest and best return on an investment based on the cost, resources, and risks involved. The two primary questions asked are:

1) How much real estate damage could result from a major flood event if inadequate flood protection or structures are in place? In this case, a major flood event was assumed as the flood inundation resulting from the 1%-annual-chance flood event. The answer to this question is considered the benefit of the project.

2) How much will it cost to construct or improve the levee infrastructure to provide 1%-annual-chance flood protection? The cost for improvements varies depending on the alternatives evaluated.

To answer these questions, a preliminary BCA has been performed. BCA is a method that determines the future risk reduction benefits of a hazard mitigation project and compares those benefits to its costs. The result is a Benefit-Cost Ratio (BCR). A project is considered cost-effective when the BCR is 1.0 or greater.

6.1 Flood Damage Assessment

This economic analysis of flood damage was conducted by methods consistent with those applied by USACE. The flood damage assessment considers two categories of costs:

- **Flood inundation damage** that will be sustained in the 1%-annual-chance flood, which are associated with both physical and nonphysical costs. Physical costs include those related to inundation damage to infrastructure, structures and their contents, and agriculture. Nonphysical costs include flood cleanup costs and the costs of flood fighting, evacuation, and traffic/transportation rerouting (USACE 1988). Refer to Figure 6-1: Maximum Parcel/Property Flood Depth and Damage Cost on page 40 that depicts maximum flood depths and damage costs.

- **Flood insurance cost** over a 50-year period. Cost for each structure varies depending upon the depth of flooding expected in a 1%-annual-chance flood.

Refer to Appendix D for more information.

6.2 Project Cost Estimation

A cost estimate to construct each of the three alternatives has been developed. Major elements of the costs include earthwork, revegetation, environmental mitigation, and property acquisition. The cost estimates are considered concept-level cost estimates. As the project progresses into future phases and decisions are made regarding alternatives and project scope, it will be appropriate to update and refine the cost estimates. For example, the cost estimate for each alternative includes $500,000 for replacement of a sanitary sewer lift station on the north side of the river. This lift station is anticipated to become obsolete due to sanitary sewer system improvements that are unrelated to the levee project. The anticipated timing of the sewer lift station decommissioning is 2023 or 2024. As costs are evaluated in future phases of the levee project, an update on the timing, disposition, and cost estimate for the sewer lift station will warrant review and consideration. Unit costs are based on recent, local projects and specifically UDOT bid tabulations for imported fill cost. Detailed cost estimates can be found in Appendix D.

Right-of-Way Cost

Private property acquisition will be required for all three proposed alternatives, to different degrees. The riverside levees are where all property acquisitions are located; Provo City owns the property adjacent to the lakeside levee (the Airport). Property acquisition for each alternative is described below:

ALTERNATIVE 1. Alternative 1 incurs the least impact to property owners as it involves replacing the levees along their existing alignment which is adjacent to the river. Property acquisition areas were calculated

using the toe of the levee as an extent. Full acquisitions include two trailer spots along the KOA levee alignment near I-15; these acquisitions will likely be required for all alternatives.

ALTERNATIVE 2A. Alternative 2A incurs a moderate impact to property owners. This alternative involves shifting the alignment of the new levees away from the riverbanks to preserve existing riparian vegetation and trail access and improve river hydraulics. Property acquisitions are accounted for using the edge of access road (10' from the landside levee toe) as an extent.

ALTERNATIVE 2B. Alternative 2B incurs the most impact to property owners. This alternative involves further shifting the levees away from the riverbank to further protect bankside vegetation, trail access, and provide better river hydraulics. Property acquisitions are accounted similarly to 2A using the edge of access road.

A rate of $12 per square foot is used for partial parcel acquisitions and costs for full acquisitions are based on the estimated market value of the home. Full acquisitions are considered where the proposed landside levee toe is within 20 feet of a structure. The following table 6-1 shows the number of parcels, acreage, and cost of property acquisition for each alternative.

Table 6-1: Summary of Property Acquisition for Each Alternative

Alternative	Partial Acquisition	Full Parcel Acquisition	Estimated Property Acquisition Cost
Alternative 1	58 parcels / 5.6 acres	2 parcels	$3,177,000
Alternative 2A	93 parcels / 7.62 acres	9 parcels	$7,282,000
Alternative 2B	93 parcels / 7.75 acres	19 parcels	$10,000,000

Cost of Environmental Impact

Agencies participating in the June Sucker Recovery Implementation Program would likely support an alternative with the most restoration opportunities in the lower Provo River. They would likely strongly oppose Alternative 1 west of Geneva Road because it would impact critical June sucker habitat (and Yellow-billed cuckoo habitat), making successful application of the stream alteration and 404 permits virtually impossible, particularly because of the large investments being made just downstream to enhance rearing habitat in the restored Provo River Delta. The Provo River Delta Restoration project is currently under construction and has previously been determined as necessary for species recovery and the planned down-listing of the June sucker from endangered to threatened. If recovery is successful, then June sucker will be removed from the Endangered Species Act altogether. The spawning and rearing functions of the lower Provo River are irreplaceable for the June sucker, which rely heavily on natural pool/riffle sequencing in the river for spawning, and a productive wetland marsh for rearing habitat at the river/lake interface for this species to complete its annual reproductive life cycle. Furthermore, Alternative 1, and to a lesser degree Alternative 2A, would not represent the least environmentally damaging practicable alternative (LEDPA), which is a requirement for an individual 404 permit.

Off-site mitigation might be possible once LEDPA requirements are met for the preferred alternative. Off-site mitigation could potentially include restoring June sucker spawning and rearing habitats in lower reaches of Spanish Fork River at its interface with Utah Lake. However, alternative tributary mitigation would only partially mitigate the impacts caused to June sucker recovery because of the importance of Provo River as the largest tributary to Utah Lake and most popular (by far) for spawning June sucker. The June sucker needs connected spawning and rearing habitat as occurs in the lower Provo River, with the restored delta at the river-lake interface. Mitigation in the form of restoring spawning and rearing habitats in Spanish Fork River or any other tributary would still be inferior to Provo River in many ways and would likely cost more than $20 million to restore suitable conditions, plus costs for land acquisition. The option to mitigate June sucker habitat in the Spanish Fork River or another

tributary is problematic given that species recovery would be set back and further delayed for decades to complete feasibility studies, designs, remove diversions, acquire properties, get permits, complete an environmental impact statement (EIS), and construct and revegetate suitable spawning and rearing habitats in a tributary without secured and protected streamflow.

The cost estimate for each alternative includes channel restoration, environmental, and vegetation management costs that reflect the mitigation strategies described above. These costs are generally much higher for alternative 1 than they are for alternatives 2A and 2B.

6.3 Benefit-Cost Summary

In the simplest terms, the BCA compares the benefit of the project, which is to avoid the cost of flood inundation damages and flood insurance, against the cost to construct the levees. The results of the preliminary (concept-level) BCA is a BCR greater than 1.0 for all three alternatives. The benefits of protection of property outweigh the cost of levee improvements based on the preliminary analysis and engineering performed. All costs used in this analysis are 2020 dollars and are subject to change.

Table 6-2: Benefit-Cost Results Summary

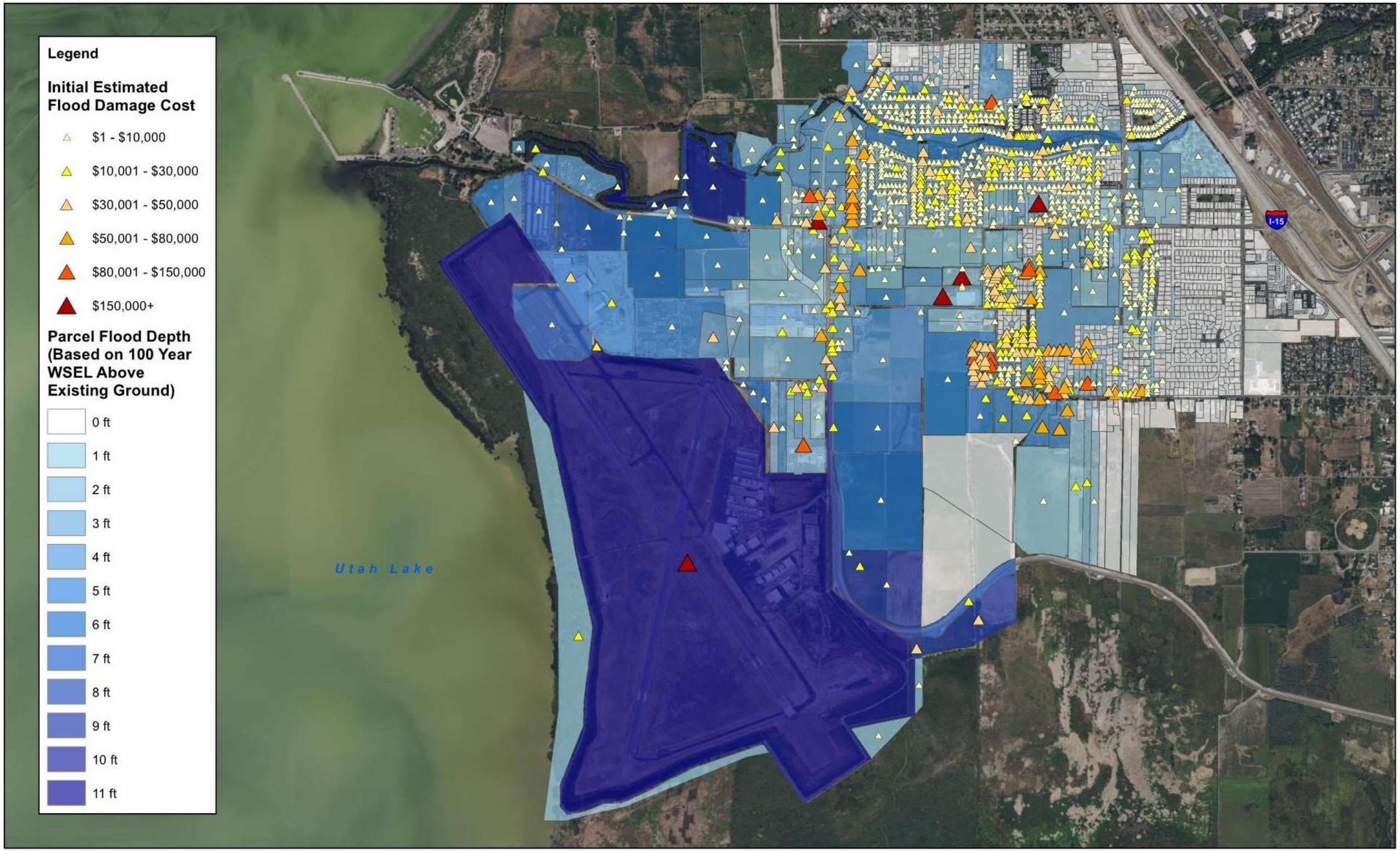
Description	**Estimated Project Cost**	**Estimated Total Flood Damage Assessment Cost**	**Net Project vs. Flood Damage Cost**	**Benefit/Cost Ratio**
Alternative 1	$74,520,832	$109,054,038	$34,533,206	**1.46**
Alternative 2A	$51,428,707	$109,054,038	$57,625,331	**2.12**
Alternative 2B	$54,504,760	$109,054,038	$54,549,278	**2.00**
"Do Nothing" Alternative	$0	$109,054,038	$109,054,038	**n/a**

It is important to note that the project costs would be assumed by Provo City and its potential funding partners, while flood damage costs, including insurance premiums, are borne by a wider group including individual property owners (residents, school district, churches, Provo City) and their insurance carriers. Thus, the economic benefits of doing the project are not to Provo City alone, but to all those who would pay for flood damage costs and insurance premiums.

In a "do nothing" alternative in which Provo City chooses not to rehabilitate the levees and accepts the proposed flood mapping changes, there are several other costs, both real and intangible, to consider in addition to flood damages and insurance premiums:

- **Increased difficulty and cost of land development.** Development in floodplain areas requires finished floor elevations to be higher than the base flood elevations. If development will alter the extent of the floodplain or affect base flood elevations, developers will need to go through a costly CLOMR/LOMR process with FEMA to amend the floodplain mapping.
- **Flood response.** The cost to Provo City, emergency response organizations and the community at large for responding to a flood situation has not been included in the flood damage assessment, but certainly could be impactful. Provo City may need to be prepared for a robust and timely response to help protect life and property, as well as to sponsor a general clean-up effort after a flooding event has occurred.
- **Long-term impact to flooded neighborhoods.** Neighborhoods that have been subjected to flooding may tend to fall into dereliction and sustain a loss of property value.
- **Potential for loss of life.** In a flooding disaster, there is always a potential for injuries or loss of life to humans and animals. Health may be affected in the aftermath of a flooding event due to stress and/or poor living conditions.

Figure 6-1: Maximum Parcel/Property Flood Depth and Damage Cost



7.0 RECOMMENDED ALTERNATIVE

The three levee rehabilitation alternatives are compared in Table 7-1 with respect to each of the major criteria that are important to Provo City. Each criterion is ranked as low, medium, or high for each alternative with a corresponding color scheme in which green is favorable and yellow/orange is less favorable.

Table 7-1: Alternatives and Criteria

Criteria	Alternative 1	Alternative 2A	Alternative 2B
Affordability	Low $74.5M B/C Ratio = 1.46	High $51.4M B/C Ratio = 2.12	Medium $54.5M B/C Ratio = 2.00
Flood risk protection/FEMA certifiability	High	High	High
River restoration potential/ environmental permit-ability	Low (potentially not feasible)	Medium	High
Recreational quality and aesthetic characteristics	Low	High	High
Minimization of private property acquisition	High 58 partial parcels = 5.60 ac + 2 full parcels	Medium 93 partial parcels = 7.62 ac + 9 full parcels	Low 93 partial parcels = 7.75 ac + 19 full parcels

Alternative 1 is not recommended due to the high cost and lowest BCR; the environmental consequences and subsequent difficult path to permitting; and the loss of the aesthetic character of the riverside levees and trail as most of the vegetation is cleared. This leaves Alternatives 2A and 2B, which are both excellent alternatives in terms of feasibility of environmental permitting and retaining much of the vegetation around the riverside and trail. The cost and many other aspects of these two alternatives are similar; the biggest difference is in the additional river habitat area that Alternative 2B provides, at a cost of 10 additional full-parcel acquisitions. Alternative 2A is recommended over 2B due to the higher cost and more acquisitions; however, environmental permitting constraints may direct the project toward Alternative 2B.

7.1 River Restoration – Important Factors and How They Relate to the Levee Project

When embarking on any project to restore the proper functioning of a riverine ecosystem, eight general factors may ultimately determine the long-term success or failure of the project. The role of these factors should always be considered, and the applicability of each factor to a given project should be evaluated and understood. These factors are legal protection, space, natural hydrology, water quality, continuity, connectivity, complexity and dynamics.

Alternative 2A has the potential to improve the channel with regard to many of these factors, such as greater space and connectivity of the river to its floodplain and more opportunities for channel dynamics and complexity. Alternative 2B will perform better than Alternative 2A by allowing more space for riverine processes and thus greater natural channel dynamics, continuity, and complexity. For a more complete discussion of river restoration factors, refer to Appendix E.

7.2 Key Considerations for Design and Construction Phases

Delivery Alternatives

Provo City will consider various project delivery methods to accomplish the design and construction of the selected alternative. This may include traditional methods like design-bid-build or alternative methods like construction

manager/general contractor (CM/GC) (construction manager/general contractor) and design-build. The alternative may benefit the City by bringing contractor expertise into the design process at an earlier stage of project completion altering risk, schedule and cost elements. CM/GC and design-build may affect key strategies related to effective earthwork operations (e.g., hauling, processing, disposal, import, etc.), environmental impacts, property impacts, permitting, and other techniques. Each method, whether traditional or alternative, has specific benefits and risks to Provo City, in addition to any constraints imposed by the project(s) funding methods.

Staging and Access

The lakeside levees will be removed and reconstructed in place. Since the City owns the surrounding property (the airport), temporary construction easements will not be necessary. Strategically placed turnarounds will be designated for construction access.

It will be more challenging to find space for turnarounds, staging, and stockpiling for the riverside levee reconstruction. The KOA area may be utilized for this purpose, and temporary construction easements will likely be necessary. It is a goal of the project that the trail be kept in use as much as possible during the construction phase.

Potential Borrow Sources

It may be possible to reuse portions of the existing lakeside levee embankments, provided they meet specification requirements for levee embankment material (the specification has not yet been developed/finalized). However, processing to remove oversized materials and organics will be required. In large measure, imported material will be used. A likely source of material is Evans Grader and Paving which operates a pit adjacent to the Utah County Public Works offices along US-89 (State Street) and 2800 South. Inquiries regarding their products indicate that Evans can produce a one-inch screen bank run which would be conducive to levee construction and can be produced relatively economically. During this study, Provo City identified potential additional borrow areas that include 1) an existing quarry owned by Provo City near Provo Canyon, 2) another area from which materials for the Provo Tabernacle reconstruction were excavated, and 3) surcharge materials from nearby roadway projects that could be recycled/reused. No information is available on the type or classification of these materials. Further evaluations of potential borrow sources for levee embankment materials is required. Selection of backfill materials for the existing moat area will require consideration for material placement near or below groundwater. Placement of non-uniform or fine-grained soils in the moat area may present earthwork construction challenges that would include moisture conditioning and dewatering.

7.3 Permits

This project will require permitting from various entities. Details regarding the submittal procedures, review period and the particulars of the major permits needed are listed below.

Federal Aviation Administration (FAA)

For the lakeside levees, permitting with the FAA will be required due to the proximity of the levees to the airport runways.

Submittal	Form 7450 - Notification for Intent of Construction – should be filed with the FAA through Provo Airport personnel.
Permit/Review	Approval may take up to 45 days, and after such time the FAA will respond with a determination letter and required conditions.
Inspection	No inspection is required by Airport personnel.
Fee	The Airport does not currently charge review or inspection fees.

Wetland Permitting

Since delineated freshwater emergent wetlands exist adjacent to the lakeside levees, permitting under the Clean Water Act Section 404 will be required.

Notification	USACE, South Pacific Division, Sacramento District, Intermountain Regulatory Branch, Bountiful Field Office. Mr. Hollis Jencks is the Utah County Project Manager, Hollis.G.Jencks@usace.army.mil, (801) 295-8380 ext. 8318. Proposed impacts to wetlands of greater than 0.5-acre will likely require a pre-application meeting.
Submittal	A permit application for the dredge or discharge of fill material into jurisdictional wetlands is required. Items required typically include a description of the purpose and need for the project including the reason the project must involve work in wetlands, an analysis of alternatives that could be utilized to avoid impacts to wetlands, a description of efforts to minimize impacts to wetlands that cannot be avoided completely, and proposal to provide compensatory mitigation for impacted wetlands. In addition, detailed engineering and cross section documents are required.
Permit/Review	Due to the presence of habitat for the threatened June sucker fish that exists within the project area, the permitting process is expected to be time-consuming and extensive. Efforts to reduce the level of wetlands impacts to 0.5-acres or less will greatly reduce the permit review time. Efforts to identify and design appropriate compensatory wetland mitigation ahead of time will also help the project schedule to move faster as the Section 404 Permit cannot be issued until a mitigation and monitoring plan is approved. Prior to making application, a pre-application meeting is recommended where applicable agencies will have a chance to hear about the project and raise concerns with USACE. Utah Division of Water Quality (DWQ) will need to provide Section 401 Certification to assure issuance of the 404 permit will not result in water quality impairment.
Inspection	USACE will have the right to inspect the project area upon permit approval.
Fee	No fee associated with a Section 404 Permit Application.

Stream Alteration Permit

Since the riverside levee construction will involve alteration of the bed and banks of the Provo River, a Stream Alteration Permit will be required. This permit is often in tandem with the USACE 404 permit.

Notification	The Stream Alteration Program staff member assigned to this area is Chuck Williamson, (801) 538-7404.
Submittal	A Joint Permit Application Form (for USACE and Utah Division of Water Rights (DWRi or State Engineer's Office) available at the DWRi website should be submitted to the DWRi. Plan and cross-sectional drawings of the proposed project are required to accompany the application.

Permit/Review	After an initial review by the DWRi, the application will be circulated for 20 days to several different federal, state, and local agencies and posted on the DWRi website for comment. DWRi staff will then assess the comments and evaluate the application. If the application is approved, it may contain limitations or conditions to minimize negative impact to the stream.
Inspection	No inspection is required.
Fee	The application fee is $500 for governmental entities.

Utah Department of Transportation (UDOT)

For any work in a UDOT right-of-way, an Encroachment Permit from UDOT will be required. UDOT roadways in the project vicinity include I-15 and Geneva Road.

Notification	UDOT Region 3 must be notified at the beginning of the design process. James Winn is the Region 3 District Permits Officer, jimwinn@utah.gov, (801) 222-3409. A pre-application meeting may be held.
Submittal	An application for an Encroachment Permit should be submitted to UDOT, typically by the contractor. Items required by UDOT include contractor liability insurance, final drawings and specifications, traffic control plan, and bonds. Any portions of the design within a UDOT right-of-way must comply with UDOT standards.
Permit/Review	An Encroachment Permit issued by UDOT will include permit terms and conditions.
Inspection	Encroachment inspections will be made by UDOT personnel during the construction phase.
Fee	An improvements inspection fee will be assessed.

In addition to the major permits listed above, permits may also be required from the following entities:

- Utah Forestry, Fire, and State Lands (right of entry application);
- Utah Pollution Discharge Elimination System (UPDES) General Construction Permit and associated Dewatering Permit;
- Provo City Floodplain Impact Permit and no-rise certification; and/or
- Canal companies.

7.4 Phasing and Timeline

The key to any project of this magnitude is to plan for the long-term and start early to mitigate risks to the cost and schedule of the project. Table 7-2 shows a tentative schedule rom the planning phase to accreditation by FEMA.

Table 7-2: Preliminary Project Timeline



*Includes levee certification documentation to FEMA and request accreditation and remapping

Note that this is a tentative schedule and variations, delays, alternatives, approvals, funding authorization, and funding allocation can shorten and/or lengthen the duration of the concept schedule. Any schedule that leads to earlier implementation will ultimately lead to earlier mitigation of flooding risk to the community.

As delivery method(s) and phasing is considered at this conceptual phase, the permitting process will likely be more intense for the riverside levees than the lakeside levee. If the permitting process for both levees occurred simultaneously, the process would be as efficient as possible in all aspects. Initially, this approach is recommended. However, as future phases evolve, the design and construction of the lakeside levee may possibly proceed faster. If the design and construction of the lakeside levee and riverside levees move forward as different phases, the cost estimating will warrant re-evaluation. For example, material to fill the moat is currently anticipated to be sequenced with the excavation of the existing riverside levees. If the lakeside levee moves forward prior to work on the riverside levee, additional source materials for import to the lakeside levee and the moat will need to be identified. This will increase the costs of that portion of the project. An offset to this increased cost to the entire project is that the future export from the riverside levees may possibly be used as fill material at other locations in the vicinity of the levee systems to bring properties to proper grade prior to development.

8.0 OPERATION AND MAINTENANCE PLAN

An Operation and Maintenance (O&M) Manual will be required as part of the levee certification process. Maintenance of the levee is critical to keeping the levees accredited as flood control structures. A critical component of the O&M Manual is the vegetation management plan. Vegetation management is necessary to protect the new levees and to make the project more desirable from a variety of permitting and NEPA perspectives. Once root intrusion has occurred, it is very difficult to restore the structural integrity of the embankment. A good vegetation management plan will not only minimize construction impacts to the ecosystem, but it could possibly be used to demonstrate improvements to existing conditions of the project area for known listed species such as June sucker, Yellow-billed cuckoo, and Ute ladies'-tresses.

The O&M Manual will include information regarding the follow items:

- the features of the project,
- operations practices,
- maintenance practices,
- schedule for condition surveys (e.g., calendar schedule [frequency per year], post-flood inspection, post-seismic activity inspection, etc.),
- vegetation management (temporary and permanent irrigation, weed treatments [five to six times per year]),
- FAA and airport coordination,
- permitting,
- enforcement, and
- emergency response procedures.

The Provo Levee O&M Manual has been outlined in Appendix F and will be completed as part of the design and construction process.

9.0 FUNDING RESOURCES

Several potential funding sources for this project are available at the federal, state, and local levels that are targeted to the different aspects of this project, including flood mitigation, infrastructure, and environmental mitigation. It is recommended that an in-depth funding analysis be conducted to determine which programs are the best fit for this project and are the most likely to produce results. The funding application process usually has a cost associated with preparing the application and most funding sources require matching city funds that range from 10 to 50 percent of the total funding amount. Funding agencies and programs to consider potentially supplementing the cost of the Provo levee rehabilitation project are as follows:

1. **FEMA Building Resilient Infrastructure and Communities (BRIC)** - The BRIC goal is to support communities as they undertake hazard mitigation projects.
2. **FEMA Flood Mitigation Assistance (FMA) Grant** is a grant program to provide funding to states, local communities, federally recognized tribes, and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program.
3. **Environmental Protection Agency (EPA) Water Infrastructure Finance and Innovation Act of 2014 (WIFIA**) is a federal credit program administered by EPA for eligible water and wastewater infrastructure projects. Eligibility for local, state, tribal, and federal government agencies.
4. **Natural Resources Conservation Service (NRCS) Watershed Protection ad Flood Prevention Act (PL 566)** authorizes the United States Department of Agriculture (USDA)NRCS to help local organizations and units of government plan and implement watershed projects. PL-566 watershed projects are locally led to solve natural and human resource problems in watersheds up to 250,000 acres (less than 400 square miles). This program works through local government sponsors and helps participants solve natural resource and related economic problems on a watershed basis.
5. **NRCS RCPP Regional Conservation Partnership Program** provides funding for regional watershed and natural resource concerns. A partner funding contribution is required, and the project must propose a solution to address a natural resource challenge.
6. **USACE** – The USACE provides funding for water resource projects. A nonfederal sponsor may be required to share the costs of the project and commit to performing maintenance of the levee after construction. USACE funding will incorporate the levees into the Periodic Inspection Program as part of Section 408 of Public Law 84-99.
7. **US Bureau of Reclamation (USBOR) WaterSMART Grants** provide 50/50 cost share funding to entities with water delivery authority for projects that contribute to water supply reliability in the western United States.
8. Agencies that provide funding for projects aiding June sucker recovery:
    - Central Utah Water Conservancy District
    - Utah Reclamation Mitigation and Conservation Commission (URMCC)
    - USBOR
    - Department of Interior (Central Utah Project Completion Act [CUPCA])
9. Agencies that provide funding for Provo River Delta mitigation:
    - US Fish and Wildlife Service
    - Utah Department of Natural Resources
    - Utah Division of Fish and Wildlife Service
    - URMCC
    - USBOR

10.0 REFERENCES

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3. Provo City, 2009. Utah Lake Dike, Brief History. January 29. 4 pp.
4. United States Army Corps of Engineers (USACE)], 1983. News Release. Sacramento District. April 18. 3 pp.
5. United States Army Corps of Engineers (USACE). Levee Owner's Manual for Non-Federal Flood Control Works: The Rehabilitation and Inspection Program, Public Law 84-99. March 2006.
6. United States Army Corps of Engineers (USACE). EP 1110-2-18: Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures. May 1, 2019.
7. State Stream Alteration Program Fact Sheet SA-1, Second Edition. Utah Division of Water Rights.
8. Provo River LAMP Study, Utah County, UT by AECOM for FEMA, July 11, 2019
9. References for flood insurance costs:

   https://quotewizard.com/home-insurance/average-cost-of-flood-insurance

   https://www.policygenius.com/homeowners-insurance/how-much-does-flood-insurance-cost/

   https://mwg.aaa.com/insurance/flood

   https://www.nerdwallet.com/article/insurance/flood-insurance

   https://www.fema.gov/flood-insurance/work-with-nfip/manuals

APPENDIX A

Levee Construction Type Options

Table A-1: Levee Construction Type Options - Riverside Levees
Project Name: Provo City West Side Levees
Project Number: 20-1278

GERHART COLE

No.	Alternative Name	Brief Description	Advantage or Benefit	Challenges or Risks	Comments
1	Sheet Piles	Long steel structural sections with a vertical interlocking system that create a continuous wall driven using vibratory pile hammers	1) Reliability: Structural section to cutoff seepage/ stabilize. 2) Groundwater: can be installed in in varying conditions. 3) Vegetation: resistant to vegetation / root penetration (have to go through steel). 4) Freeboard: can extend above levee section to provide (buried or capped). 5) Trail Access: relatively small working footprint (would still require trail shutdown). 6) Contractor Availability: Contractor Availability: favorable local availability.	1) Reliability: steel section will corrode over time and will require maintenance / repair; non steel sections are available but create driveability challenges. 2) Fluctuations in steel / petroleum prices create risks for planning and estimating probable costs. 3) Construction Challenges: Foundation conditions would need to be conducive to sheet pile installation (no cobbles/boulders and loose/soft to medium dense/stiff deposits). 4) Construction Challenges: Installation may result in vibrations that could pose risks ranging from public nuisance to impacting structures. 5) Construction Challenges: Requires relocation of utilities that cross perpendicular to the alignment. 6) Construction Challenges: Aesthetic treatments may be necessary to cover top of sheets / protect public from exposed metal edges. 7) Reliability: Joints are not typically water tight, but can be treated to reduce losses through joints. 8) Construction Challenges: Costly to repair for future utility penetrations. 9) Construction Costs: High (challenging driving conditions)	- - -
2	Secant Pile / Deep Soil Mixing	Drilled concrete structural sections either constructed with concrete and structural reinforcing steel or cement amended soil. Drilled sections are overlapped to form a continuous wall section	1) Reliability: Can be constructed around utilities and penetrations 2) Groundwater: can be installed in in varying conditions. 3) Vegetation: resistant to vegetation / root penetration (have to go through concrete). 4) Freeboard: can extend above levee section to provide (buried or capped). 5) Construction Risks: can be installed and performs well in various conditions. 6) Construction Risks: Cement has lower mobility and less likely to follow path of roots into adjacent properties.	1) Trail Access: time consuming (would likely require extended/lengthy trail shutdown). 2) Contractor Availability: Limited 3) Construction Risks: Hole caving / subsidence. 4) Construction Risks: Requires carefully coordination with utility penetrations. 6) Construction Risks: Potentially messy / have to haul away spoils / clean-up concrete 7) Construction Risks: Costly to repair for future utility penetrations 8) Construction Costs: High	**Lakeside as Compared to Riverside:** 1) Will have to drill/mix deeper given less lateral resistance.
3	Excavated / Trenched Cutoff Wall (soil amended / cement bentonite)	Levee embankment and foundations materials are improved through the construction (excavation / trench) of a soil amended (soil bentonite) or cement (cement bentonite) cutoff wall.	1) Groundwater: can be installed in in varying conditions. 2) Relative Construction Costs: High productivity / daily production and low costs of materials.	1) Reliability: used frequency across the country. 2) Vegetation: limited resistance to vegetation 3) Freeboard: challenges in adjusting freeboard for future settlements. 4) Trail Access: limited equipment access / material delivery for site. 5) Construction Risks: Fluid mobilizing along roots / utilities into adjacent properties. 6) Construction Risks: Requires relatively large mixing / working platform pad (1ft wide per 1ft deep). 7) Construction Risks: Requires cutting off the top section of the levees to construct a working pad.	- - -
4	Inverted T-Walls / Flood Walls	Construction of a reinforced concrete cutoff wall through levee embankment	1) Reliability: Structural section to cutoff seepage / stabilize. 2) Vegetation: resistant to vegetation / root penetration (have to go through concrete). 3) Contractor Risks Challenges: Relatively cheap construction / simple system. 4) Contractor Availability: favorable local availability.	1) Groundwater: dewatering in coarse grained deposits; would likely require expensive groundwater dewatering (depending on time of year). 2) Freeboard: can extend above levee section to provide (buried or exposed), but set once constructed. 3) Trail access: trail will be out of commission for duration. 4) Construction Risks: Keeping trenches open during construction / may require shoring. 5) Construction Risks: temporary excavation / slopes to install the flood wall. 6) Construction Risks: Peat deposits settlements. 7) Construction Risks: Vibration during compaction. 8) Construction Costs: Moderate	- - -
5	Box Culverts	Directing channel through a series of adjacent box culverts.	1) Reliability: buried structural section (frequently used in river environment). 2) Vegetation: resistant to vegetation / root penetration (have to go through concrete). 3) Freeboard: addressed through capacity / size of boxes. 4) Contractor Availability: favorable local availability.	1) Groundwater: dewatering in coarse grained deposits; would likely require expensive groundwater dewatering (depending on time of year). 2) Trail access: Reduces visibility of water features in open space. 3) Will require culverts large enough to pass design flows. 4) Construction Risks: compaction near adjacent homes. 5) Construction Risks: sizes of box may require diversion of river to construct / precast lots of moving parts. 6) Maintenance: Long stretches of culverts may be difficult to clean or maintain clear of debris. 7) Construction Costs: Moderate	- - -

Table A-1: Levee Construction Type Options - Riverside Levees
Project Name: Provo City West Side Levees
Project Number: 20-1278

No.	Alternative Name	Brief Description	Advantage or Benefit	Challenges or Risks	Comments
6	Levee Reconstruction (existing locations)	Removal and replacement of existing levee embankments	1) Reliability: has worked well in the past. 2) Freeboard: simple construction / grading to adjust for future settlements. 3) Contractor Availability: favorable local availability. 4) Relative Construction Costs: lower cost of materials / labor	1) Reliability: Will require maintenance to address burrowing pests, landscaping, cut down vegetation / trees, keep home owners from encroaching on property. 2) Reliability: Not as settlement sensitive as other options; if it settles simply raise profile 3) Groundwater: excavation / foundation preparation below water in coarse grained deposits. 4) Vegetation: remove vegetation and kept it off. 5) Trail Access: trail out until construction completed. 6) Construction Risk: Existing materials would need to be stockpiled and processed for reuse (need stockpile area) 7) Construction Risk: Settlement of adjacent properties, structures, utilities from embankment construction and compaction vibration; relatively small raises above existing. 8) Construction Risk: Dust and noise from placement and processing of materials (crushers / haul truck). 9) Construction Risk: Requires a large footprint to accommodate slopes and travel ways. 10) Construction Costs: Low	- - -
7	Setback Levees (realignment)	Relocation and construction of new levee embankments	1) Reliability: has worked well in the past. 2) Groundwater: can be constructed away from the river with less surface water. 3) Freeboard: simple construction / grading to adjust for future settlements. 4) Contractor Availability: favorable local availability. 5) Vegetation: can maintain vegetation near river, but would have to keep vegetation of off setback levees. 6) Relative Construction Costs: lower cost materials / labor	1) Reliability: Will require maintenance to address burrowing pests, landscaping, cut down vegetation / trees, keep home owners from encroaching on property, and will require more property purchase to facilitate. 2) Trail Access: can maintain trail access for most of alignment. 3) Construction Risks: Challenging to get equipment in and out; narrow / linear haul areas. 4) Construction Risks: Import of new materials. 5) Construction Risks: Settlement of adjacent properties, structures, utilities from embankment construction and compaction vibration. 6) Construction Risks: Require large footprint to accommodate slopes and travel ways (likely travel takes). 7) Construction Risks: Environmental issues / possible wetland impacts. 8) Construction Costs: Low	- - -

Notes:
a) Alternatives compared across the following areas:
1. Reasonable Assurance / Maintenance / Reliability
2. Groundwater
3. Vegetation
4. Freeboard
5. Trail Access
6. Construction Risks / Challenges
7. Contractor Availability
8. Relative Construction Costs

Table A-2: Levee Construction Type Options - Lakeside Levees
Project Name: Provo City West Side Levees
Project Number: 20-1278

GERHART COLE

No.	Alternative Name	Brief Description	Advantage or Benefit	Challenges or Risks	Comments
1	Sheet Piles	Long steel structural sections with a vertical interlocking system that create a continuous wall driven using vibratory pile hammers	1) Reliability: Structural section to cutoff seepage/ stabilize. 2) Groundwater: can be installed in in varying conditions. 3) Vegetation: resistant to vegetation / root penetration (have to go through steel). 4) Freeboard: can extend above levee section to provide (buried or capped). 5) Trail Access: relatively small working footprint (would still require trail shutdown). 6) Contractor Availability: favorable local availability.	1) Reliability: steel section will corrode over time and will require maintenance / repair; non steel sections are available but create driveability challenges. 2) Fluctuations in steel / petroleum prices create risks for planning and estimating probable costs. 3) Construction Challenges: Embankment conditions would need to be conducive to sheet pile installation (no cobbles/boulders). 4) Construction Challenges: Requires relocation of utilities that cross perpendicular to the alignment. 5) Construction Challenges: Aesthetic treatments may be necessary to cover top of sheets / protect public from exposed metal edges. 6) Reliability: Joints are not typically water tight, but can be treated to reduce losses through joints. 7) Construction Challenges: Costly to repair for future utility penetrations. 8) Construction Costs: Moderate	**Lakeside as Compared to Riverside:** 1) Foundation conditions more suitable to driving sheet piles. 2) Will have to tip sheets deeper given the soft lacustrine deposits 3) Less utilities to relocate 4) Mast heights / restrictions with airport
2	Secant Pile / Deep Soil Mixing	Drilled concrete structural sections either constructed with concrete and structural reinforcing steel or cement amended soil. Drilled sections are overlapped to form a continuous wall section	1) Reliability: Can be constructed around utilities and penetrations. 2) Groundwater: can be installed in in varying conditions. 3) Vegetation: resistant to vegetation / root penetration (have to go through concrete). 4) Freeboard: can extend above levee section to provide (buried or capped). 5) Trail Access: restricted trail access for extended period of time. 6) Construction Risks: Cement has lower mobility and less likely to follow path of roots into adjacent properties.	1) Trail Access: time consuming (would likely require extended/lengthy trail shutdown). 2) Contractor Availability: Limited 3) Construction Risks: Hole caving / subsidence / soft soils. 4) Construction Risks: Requires carefully coordination with utility penetrations. 6) Construction Risks: Potentially messy / have to haul away spoils / clean-up concrete 7) Construction Risks: Costly to repair for future utility penetrations 8) Construction Costs: High	**Lakeside as Compared to Riverside:** 1) Will have to drill/mix deeper given less lateral resistance.
3	Excavated / Trenched Cutoff Wall (soil amended / cement bentonite)	Levee embankment and foundations materials are improved through the construction (excavation / trench) of a soil amended (soil bentonite) or cement (cement bentonite) cutoff wall.	1) Groundwater: can be installed in varying conditions. 2) Relative Construction Costs: High productivity / daily production and low costs of materials.	1) Reliability: used frequency across the country. 2) Vegetation: limited resistance to vegetation 3) Freeboard: challenges in adjusting freeboard for future settlements. 4) Trail Access: limited equipment access / material delivery for site. 5) Construction Risks: Fluid mobilizing along roots / utilities into lake. 6) Construction Risks: Requires relatively large mixing / working platform pad (1ft wide per 1ft deep). 7) Construction Risks: Working near airport with high mast equipment. 8) Construction Risks: Start / End trench transition. 9) Construction Risks: Requires cutting off the top section of the levees to construct a working pad.	**Lakeside as Compared to Riverside:** 1) risk of contamination in Utah Lake 2) Possible challenges with overhead airplane traffic and digging
4	Inverted T-Walls / Flood Walls	Construction of a reinforced concrete cutoff wall through levee embankment	1) Reliability: Structural section to cutoff seepage / stabilize. 2) Vegetation: resistant to vegetation / root penetration (have to go through concrete). 3) Contractor Risks Challenges: Relatively cheap construction / simple system. 4) Contractor Availability: favorable local availability.	1) Groundwater: dewatering in fine-grained deposits with adjacent lake. 2) Freeboard: can extend above levee section to provide (buried or exposed), but set once constructed. 3) Trail access: trail will be out of commission for duration. 4) Construction Risks: Keeping trenches open during construction / may require shoring. 5) Construction Risks: temporary excavation / slopes to install the flood wall. 6) Construction Risks: Fine-grained soil deposit construction and settlements. 7) Construction Risks: Vibration during compaction. 8) Construction Costs: Moderate	**Lakeside as Compared to Riverside:** 1) Long-term settlements may lead to wall cracking / performance issues
5	Levee Reconstruction (existing locations)	Removal and replacement of existing levee embankments	1) Reliability: has worked well in the past. 2) Freeboard: simple construction / grading to adjust for future settlements. 3) Contractor Availability: favorable local availability. 4) Relative Construction Costs: lower cost of materials / labor	1) Reliability: Will require maintenance to address burrowing pests, landscaping, cut down vegetation / trees, keep home owners from encroaching on property. 2) Reliability: Not as settlement sensitive as other options; if it settles simply raise profile 3) Groundwater: excavation / foundation preparation below water in coarse grained deposits. 4) Vegetation: remove vegetation and kept it off. 5) Trail Access: trail out of commission until construction completed. 6) Construction Risk: Existing materials would need to be stockpiled and processed for reuse (need stockpile area) 7) Construction Risk: settlements have largely occurred below existing embankments. 8) Construction Risk: Requires a large footprint to accommodate slopes and travel ways. 9) Construction Costs: Low	**Lakeside as Compared to Riverside:** 1) More working footprint / area and less impacts to housing 2) Development of strength / equipment traffic in soft lake deposits 3) Would likely require dewatering 4) Settlements largely occurred below existing embankments.

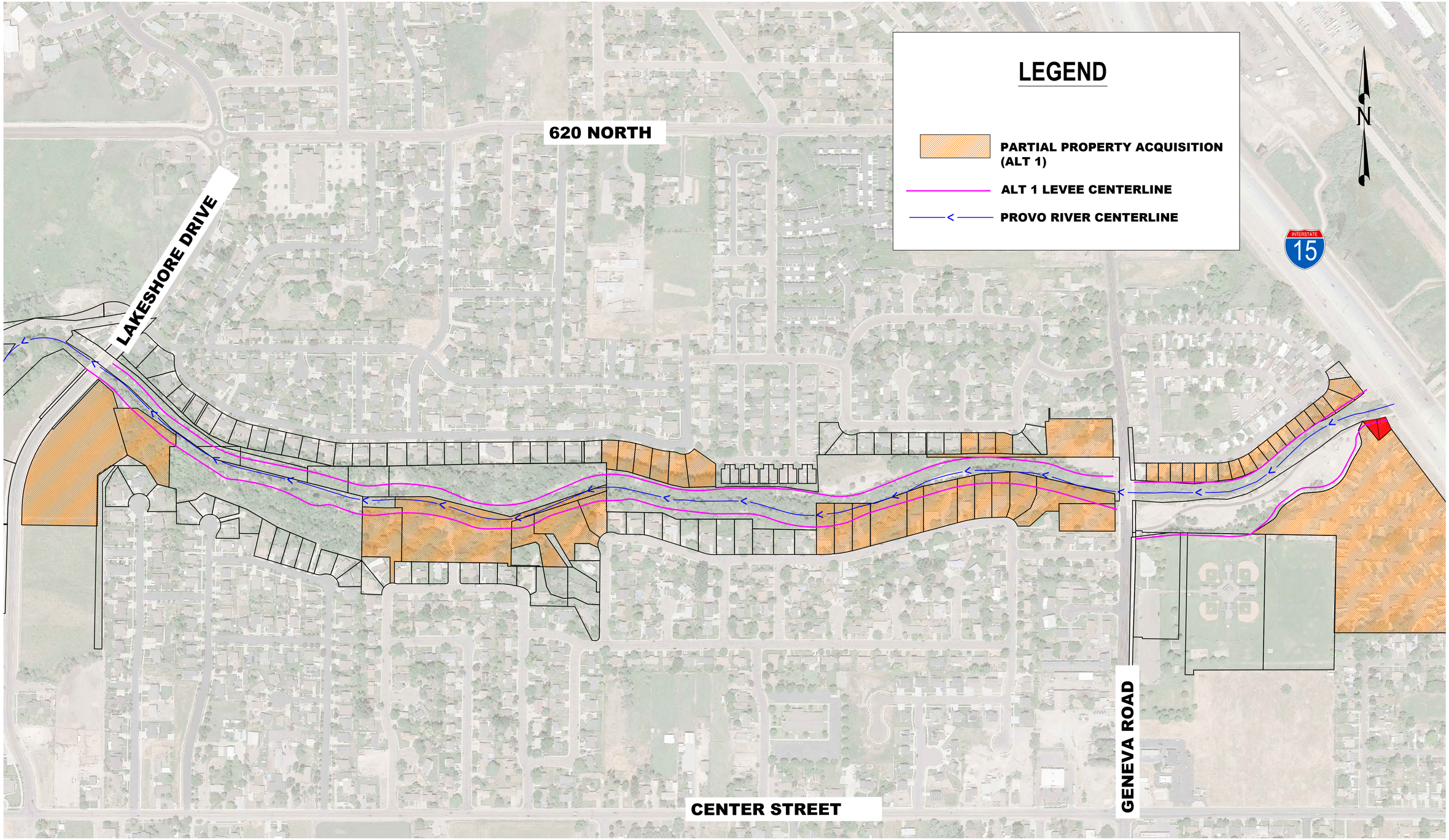
Table A-2: Levee Construction Type Options - Lakeside Levees
Project Name: Provo City West Side Levees
Project Number: 20-1278

No.	Alternative Name	Brief Description	Advantage or Benefit	Challenges or Risks	Comments
6	Setback Levees (realignment)	Relocation and construction of new levee embankments	1) Reliability: has worked well in the past. 2) Freeboard: simple construction / grading to adjust for future settlements. 3) Contractor Availability: favorable local availability. 4) Relative Construction Costs: lower cost of materials / labor	1) Reliability: Will require maintenance to address burrowing pests, landscaping, cut down vegetation / trees, keep home owners from encroaching on property, and will require more property purchase to facilitate. 2) Trail Access: can maintain trail access for most of alignment. 3) Construction Risks: Challenging to get equipment in and out; narrow / linear haul areas. 4) Construction Risks: Import of new materials. 5) Construction Risks: Near surface / soft deposits. 6) Construction Risks: Settlement of adjacent properties, structures, utilities from embankment construction and compaction vibration. 7) Construction Risks: Require large footprint to accommodate slopes and travel ways (likely travel takes). 8) Construction Risks: Environmental issues / possible wetland impacts. 9) Construction Costs: Low	**Lakeside as Compared to Riverside:** 1) More working footprint / area 2) Development of strength / equipment traffic in soft lake deposits 3) Would likely require dewatering

Notes:
a) Alternatives compared across the following areas:
1. Reasonable Assurance / Maintenance / Reliability
2. Groundwater
3. Vegetation
4. Freeboard
5. Trail Access
6. Construction Risks / Challenges
7. Contractor Availability
8. Relative Construction Costs

APPENDIX B

Right-of-Way Analysis



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IF THE ABOVE SCALE BAR DOES NOT MEASURE 1-INCH IN LENGTH, DO NOT USE THIS DRAWING FOR SCALING PURPOSES. DIMENSIONS AND MEASUREMENTS SPECIFIED IN THE DRAWING TAKE PRECEDENCE TO SCALED MEASUREMENTS.

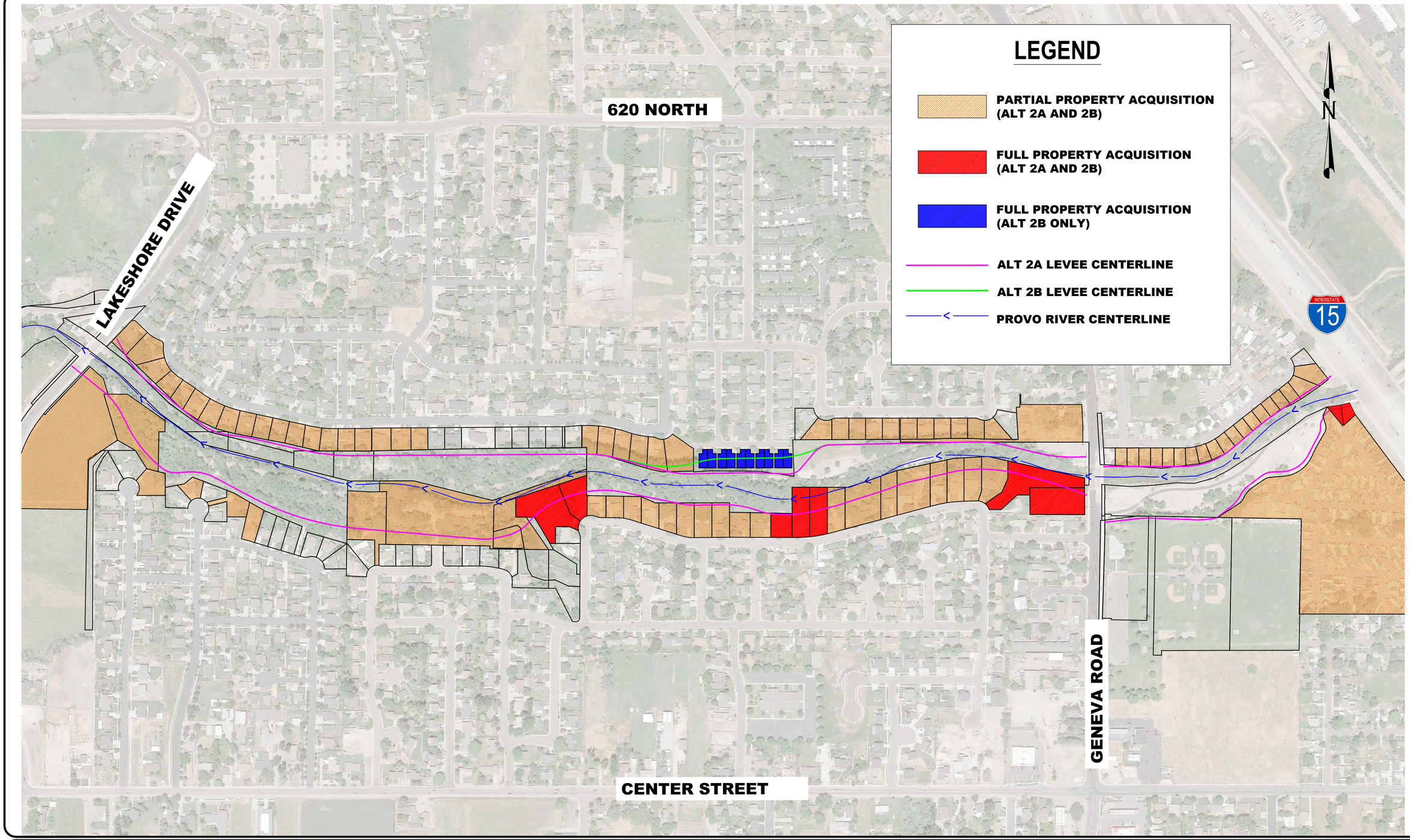
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RIVER LEVEE PROPERTY ACQUISITIONS ALTERNATIVE 1

PROJECT NUMBER	2019-0033
SHEET	1
OF	1
SHEET NUMBER	1



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RIVER LEVEE PROPERTY ACQUISITIONS ALTERNATIVES 2A & 2B

PROJECT NUMBER
2019-0033

SHEET 1 OF 1

SHEET NUMBER
1

APPENDIX C

Levee Alternative Plans

CONCEPTUAL ONLY – NOT FOR CONSTRUCTION

Lakeside Levee Conceptual Plans, Sheets 1-27
Riverside Levee Conceptual Plans, Sheets 1-23

PROVO CITY
LAKESIDE LEVEE
CONCEPTUAL NFC DESIGN

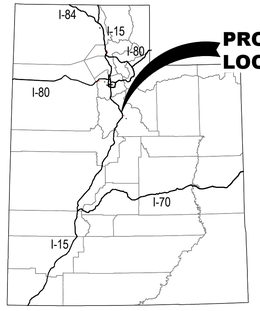
PROVO RIVER & TRAIL
PROVO, UTAH

ISSUE DATE: DEC. 2020



PROJECT VICINITY MAP
N.T.S.

STATE OF UTAH



LEGEND

MAJOR HIGHWAY
COUNTY LINE

SHEET LIST TABLE		
SHEET	SHEET TITLE	SHEET DESCRIPTION
1	G001	TITLE SHEET
2	CP100	LAKESIDE LEVEE SHEET KEY
3	CP101	LAKESIDE LEVEE PLAN
4	CP102	LAKESIDE LEVEE PLAN
5	CP103	LAKESIDE LEVEE PLAN
6	CP104	LAKESIDE LEVEE PLAN
7	CP105	LAKESIDE LEVEE PLAN
8	CP106	LAKESIDE LEVEE PLAN
9	CP107	LAKESIDE LEVEE PLAN
10	CP108	LAKESIDE LEVEE PLAN
11	CP109	LAKESIDE LEVEE PLAN
12	CP110	LAKESIDE LEVEE PLAN
13	CP111	LAKESIDE LEVEE PLAN
14	CP112	LAKESIDE LEVEE PLAN
15	CP113	LAKESIDE LEVEE PLAN
16	CP114	LAKESIDE LEVEE PLAN
17	CP115	LAKESIDE LEVEE PLAN
18	CP116	LAKESIDE LEVEE PLAN
19	CP117	LAKESIDE LEVEE PLAN
20	CP118	LAKESIDE LEVEE PLAN
21	CP119	LAKESIDE LEVEE PLAN
22	CP120	LAKESIDE LEVEE PLAN
23	CP121	LAKESIDE LEVEE PLAN
24	CP122	CENTER STREET LEVEE PLAN
25	CP123	CENTER STREET LEVEE PLAN
26	CP124	CENTER STREET LEVEE PLAN
27	TYP1	TYPICAL LEVEE DETAILS

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RECORD OF REVISIONS

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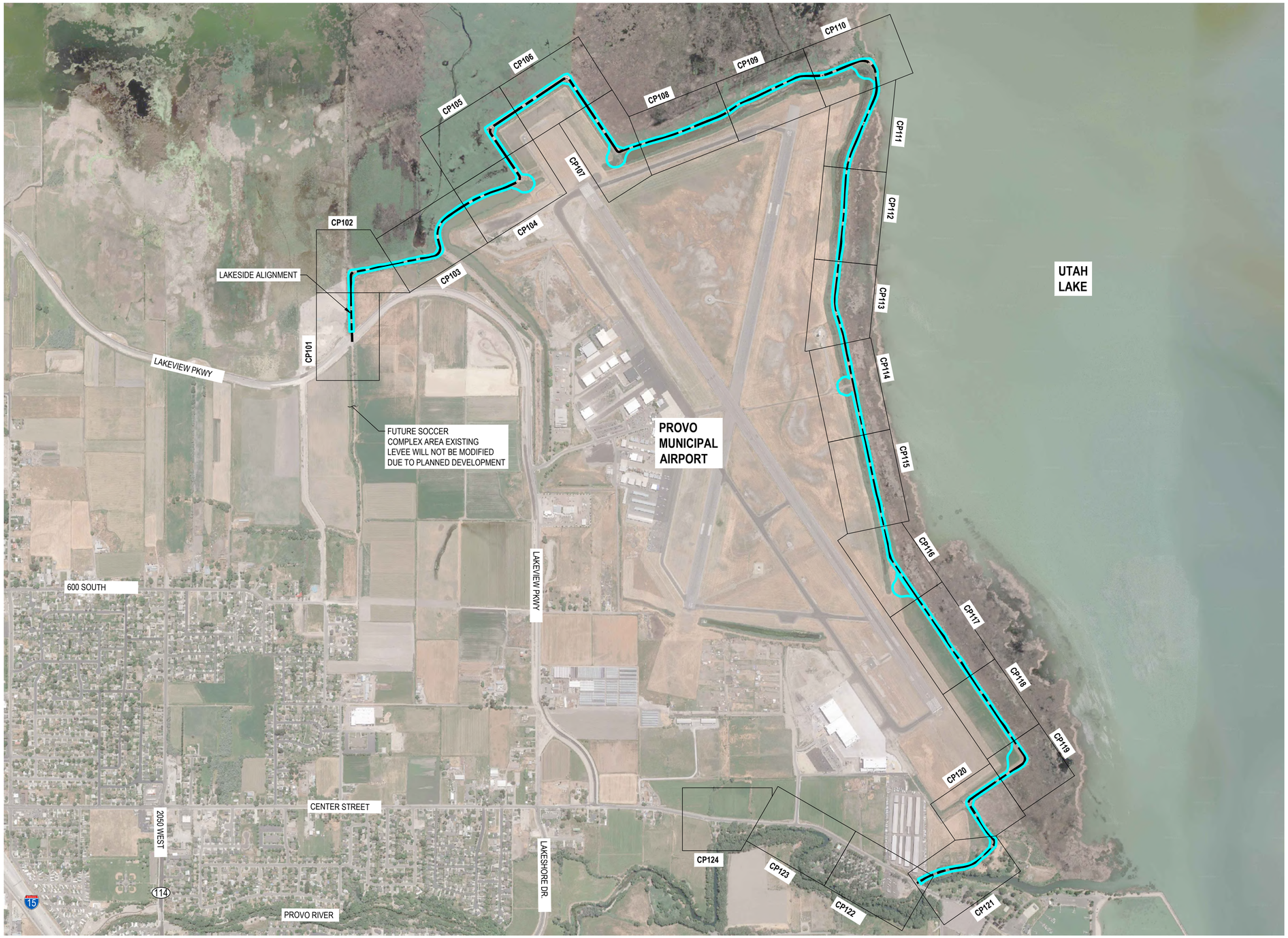
PRINCIPAL: M. HIRST, PE
PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
DRAWN BY: K. FOSTER, G. RICH
DRAWING SCALE: AS SHOWN
ISSUE DATE: DEC. 2020

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PROVO CITY
LAKESIDE LEVEE
TITLE SHEET

PROVO RIVER & TRAIL — PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 1 OF: 27
SHEET NUMBER: G001



N

0 750' 1500'

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PROJECT MANAGER	B. ROOD
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DRAWN BY	K. FOSTER, G. RICH
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ISSUE DATE	DEC. 2020

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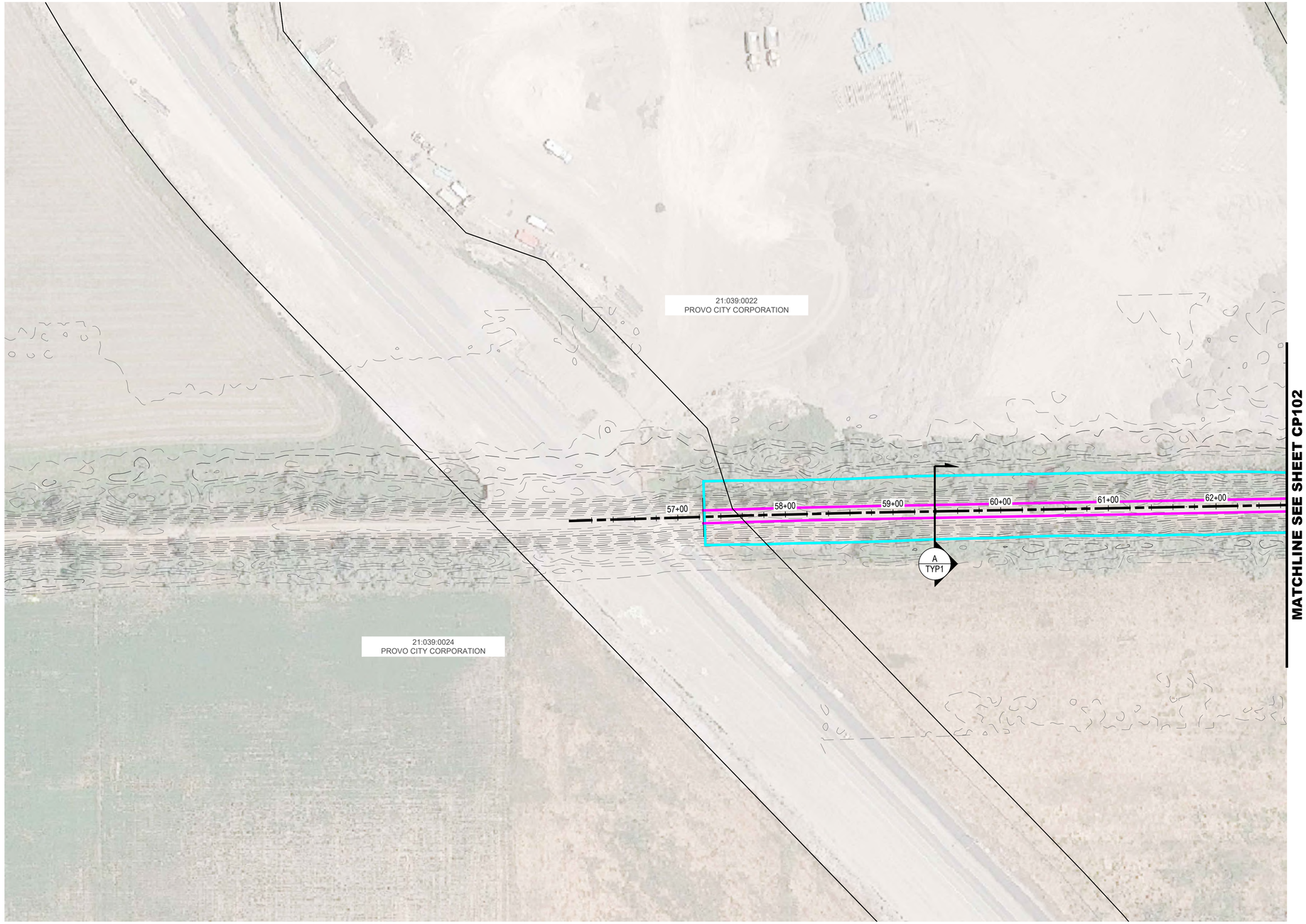
PROVO CITY
LAKESIDE LEVEE
LAKESIDE LEVEE SHEET KEY

PROVO RIVER & TRAIL — PROVO, UTAH

PROJECT NUMBER 2019-0033

SHEET 2 OF 27

SHEET NUMBER CP100



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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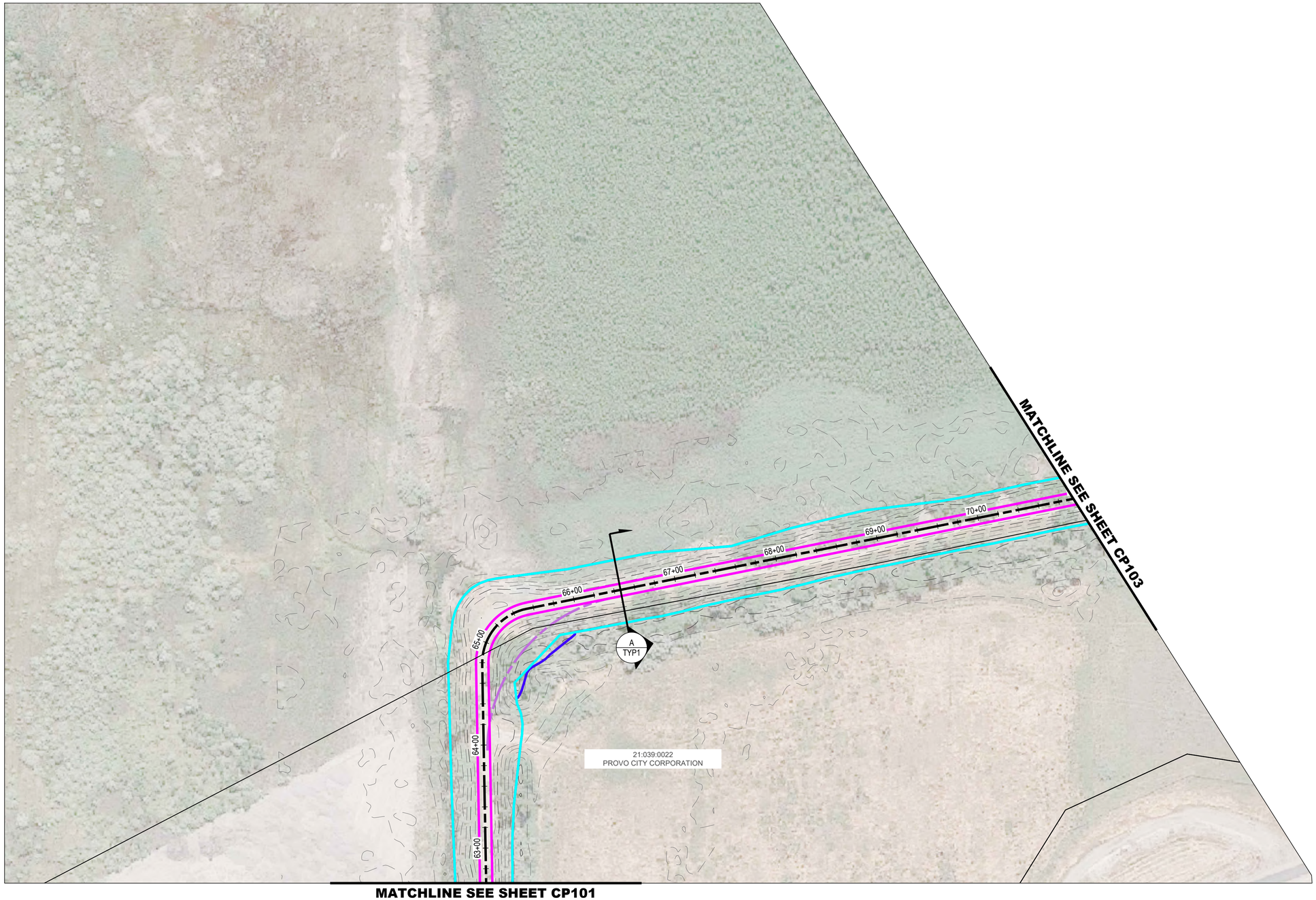
PRINCIPAL: M. HIRST, PE
PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
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PROVO CITY
LAKESIDE LEVEE
LAKESIDE LEVEE PLAN

PROVO RIVER & TRAIL
PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 3 OF: 27
SHEET NUMBER: CP101



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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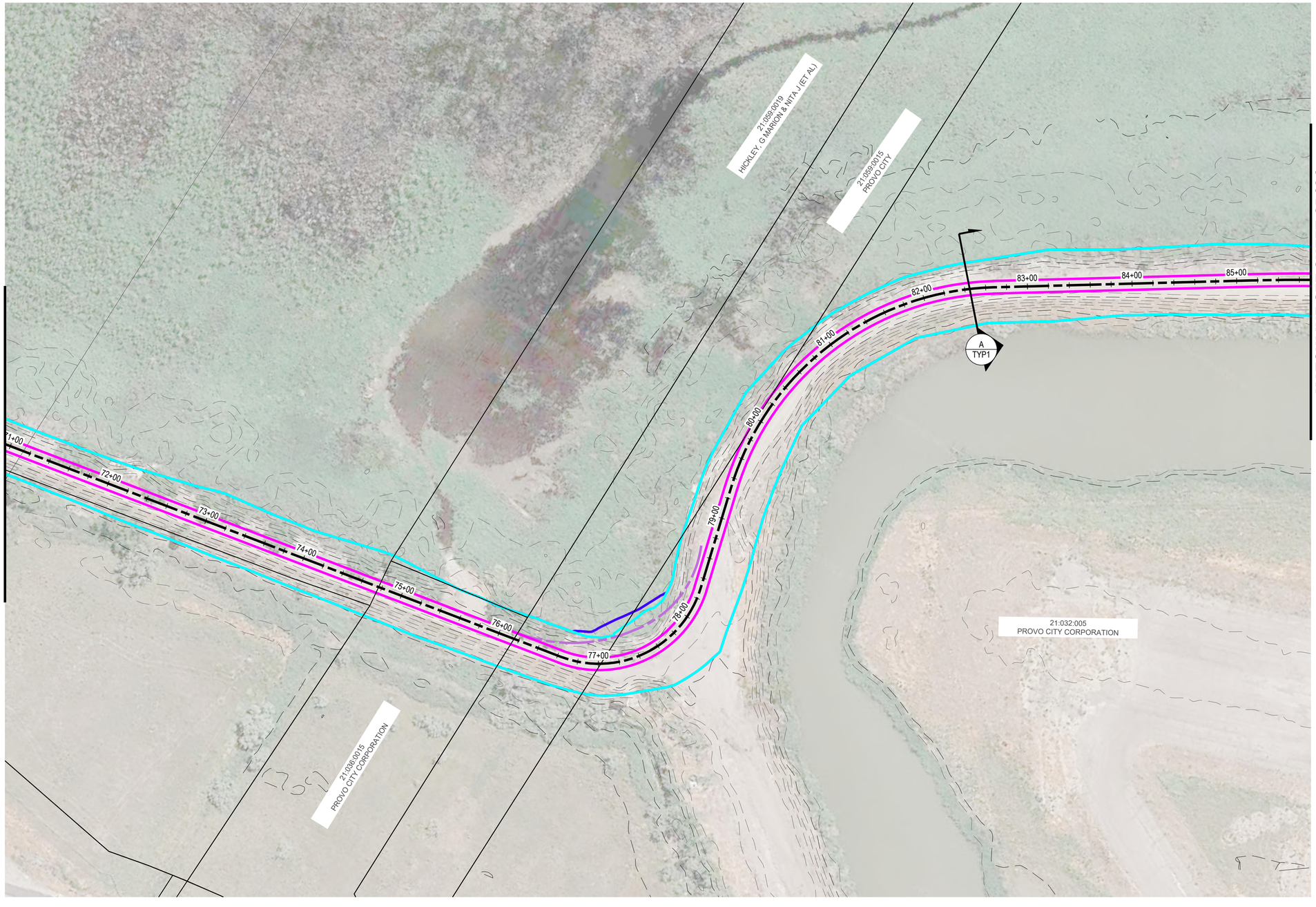
PRINCIPAL: M. HIRST, PE
PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
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LAKESIDE LEVEE PLAN

PROVO RIVER & TRAIL
PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 4 OF: 27
SHEET NUMBER: CP102



0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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LAKESIDE LEVEE
LAKESIDE LEVEE PLAN

PROVO RIVER & TRAIL
PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 5 OF: 27
SHEET NUMBER: CP103

MATCHLINE SEE SHEET CP105

MATCHLINE SEE SHEET CP103

21:058:0015
PROVO CITY

21:032:005
PROVO CITY CORPORATION

86+00
87+00
88+00
89+00
90+00
91+00
92+00
93+00
94+00
95+00
96+00
97+00

A
TYP1

N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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LAKESIDE LEVEE PLAN

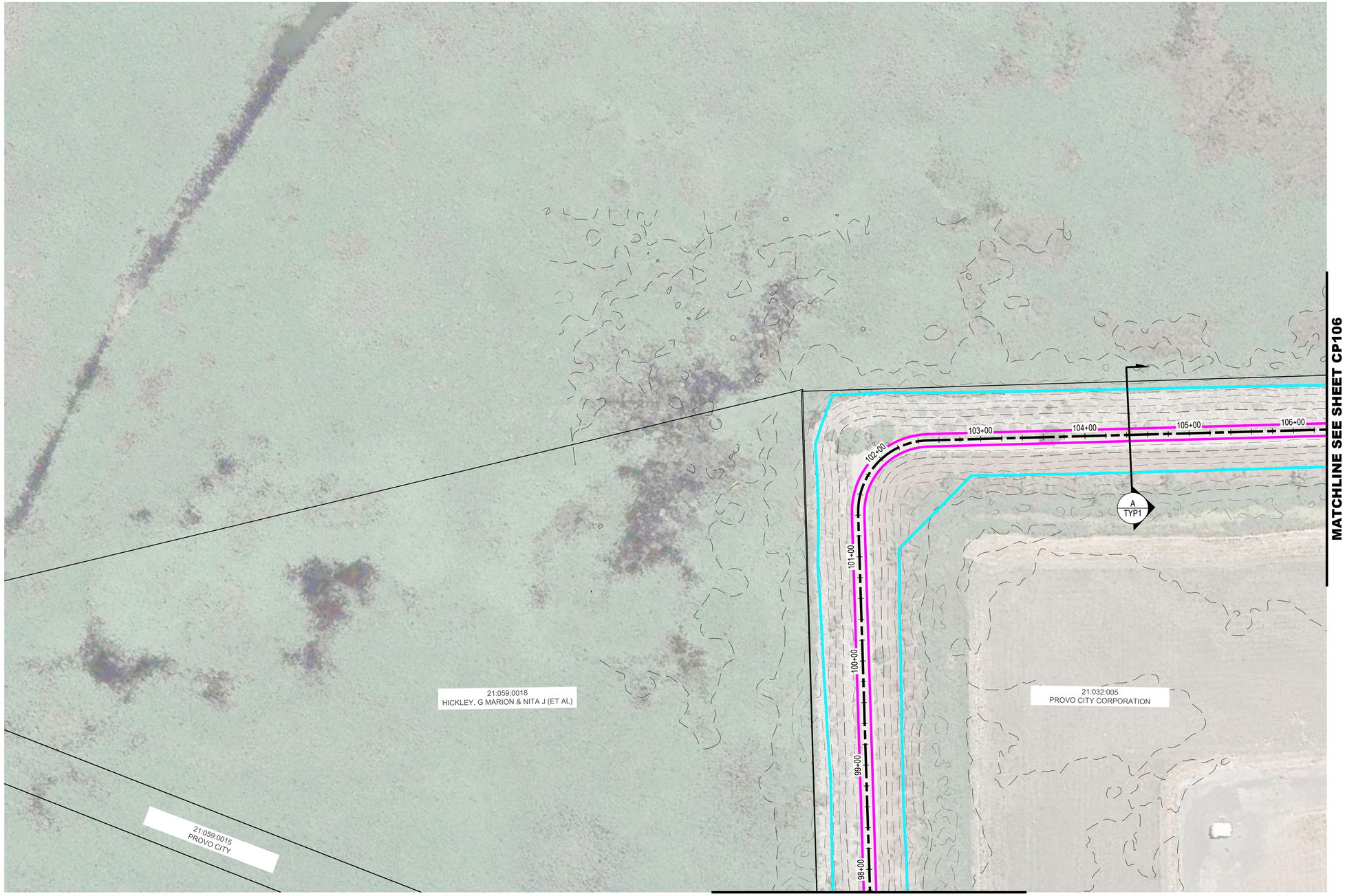
PROVO RIVER & TRAIL

PROVO, UTAH

PROJECT NUMBER 2019-0033

SHEET 6 OF 27

SHEET NUMBER CP104



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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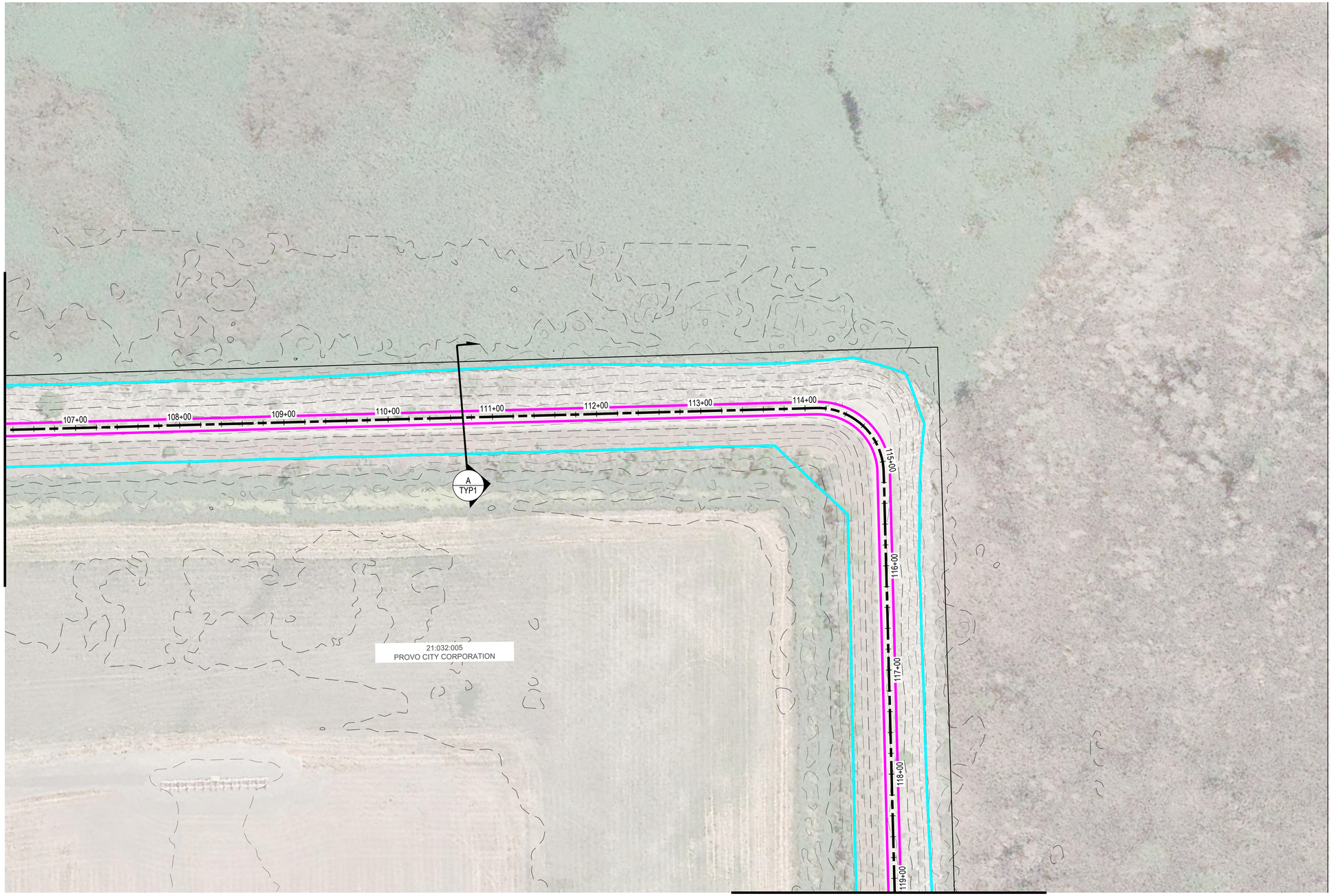
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LAKESIDE LEVEE PLAN

PROVO RIVER & TRAIL
PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 7 OF: 27
SHEET NUMBER: CP105





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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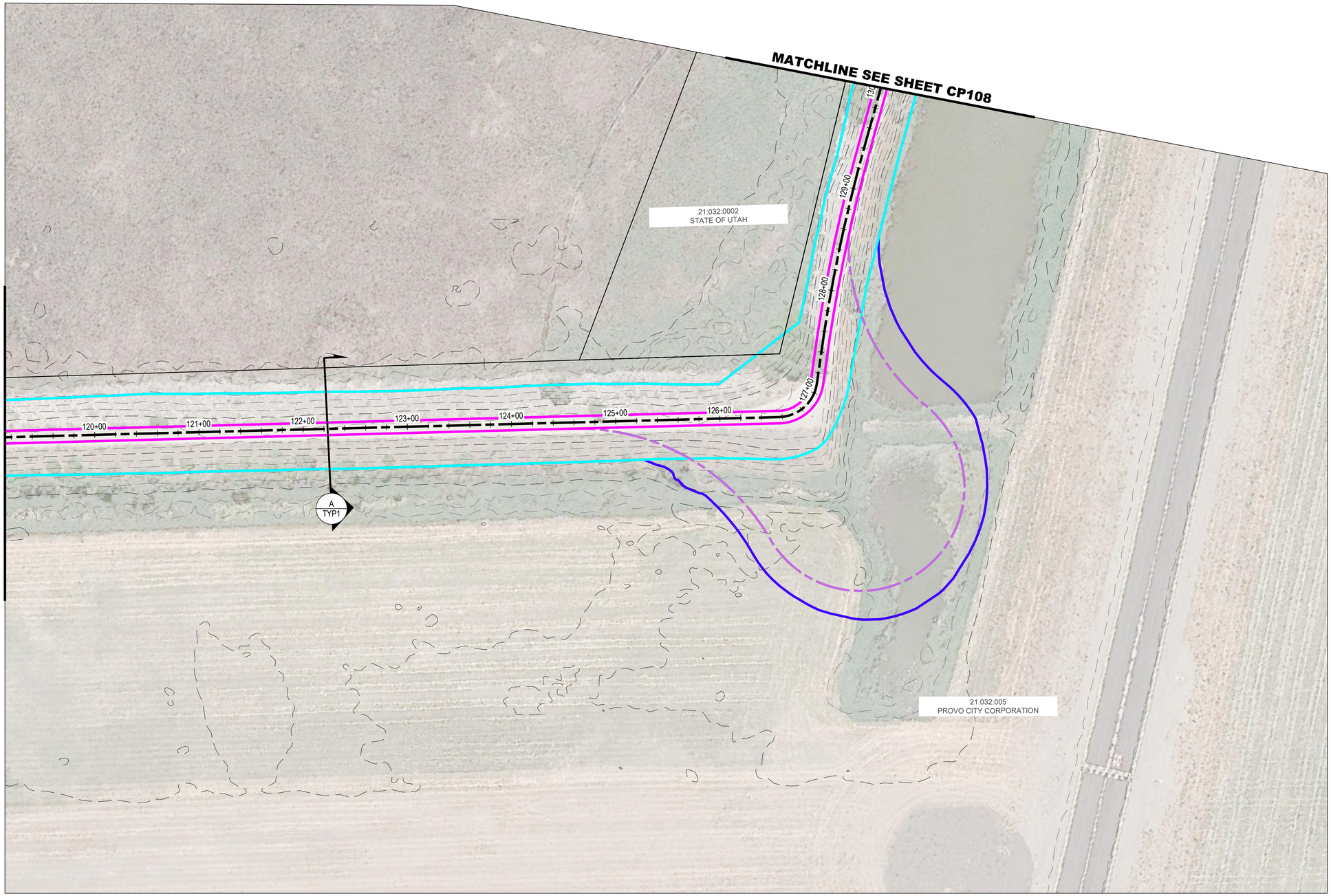
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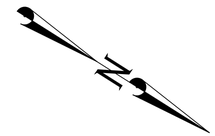
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PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 8 OF: 27
SHEET NUMBER: CP106





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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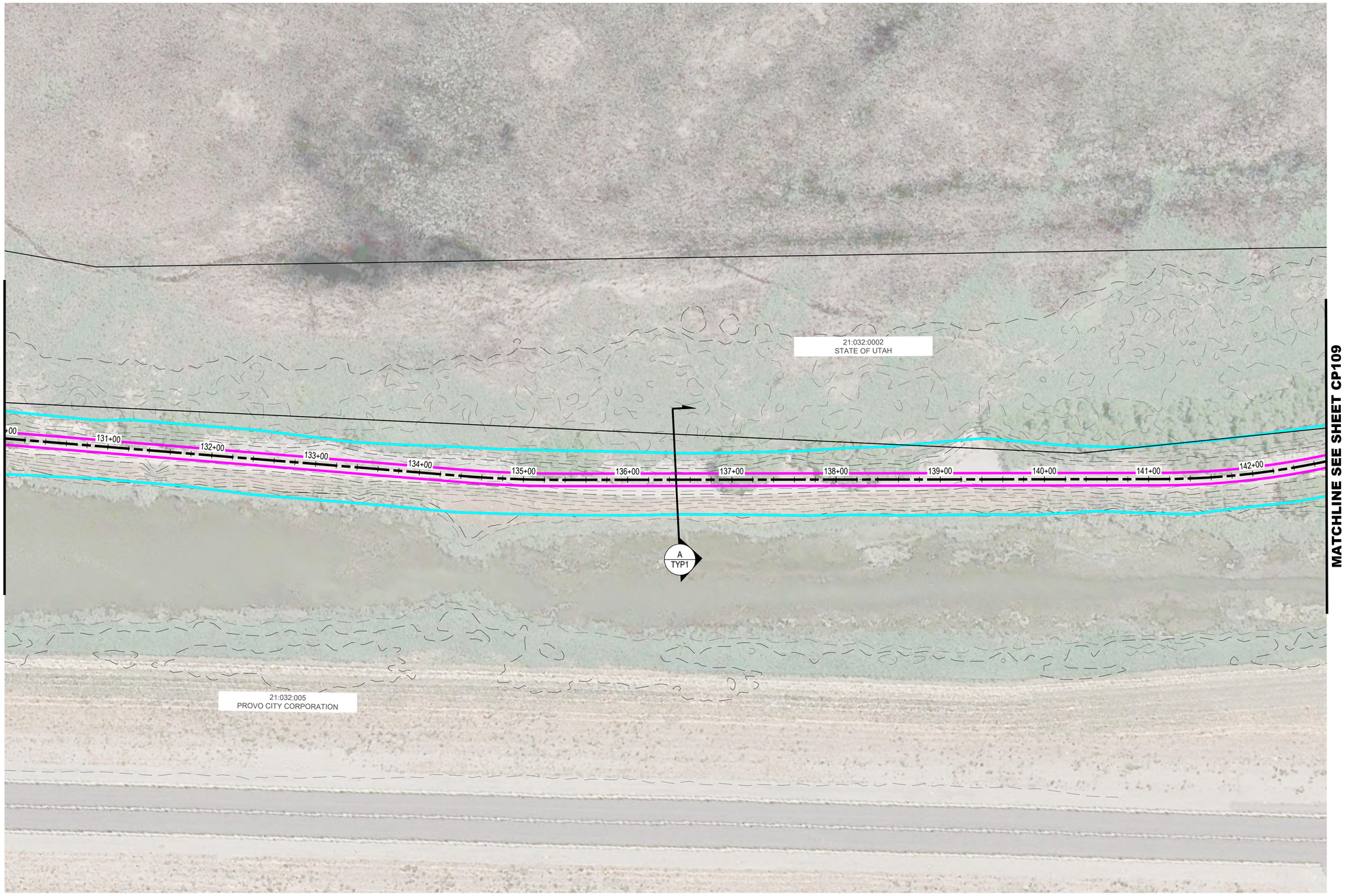
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PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 9 OF: 27
SHEET NUMBER: CP107



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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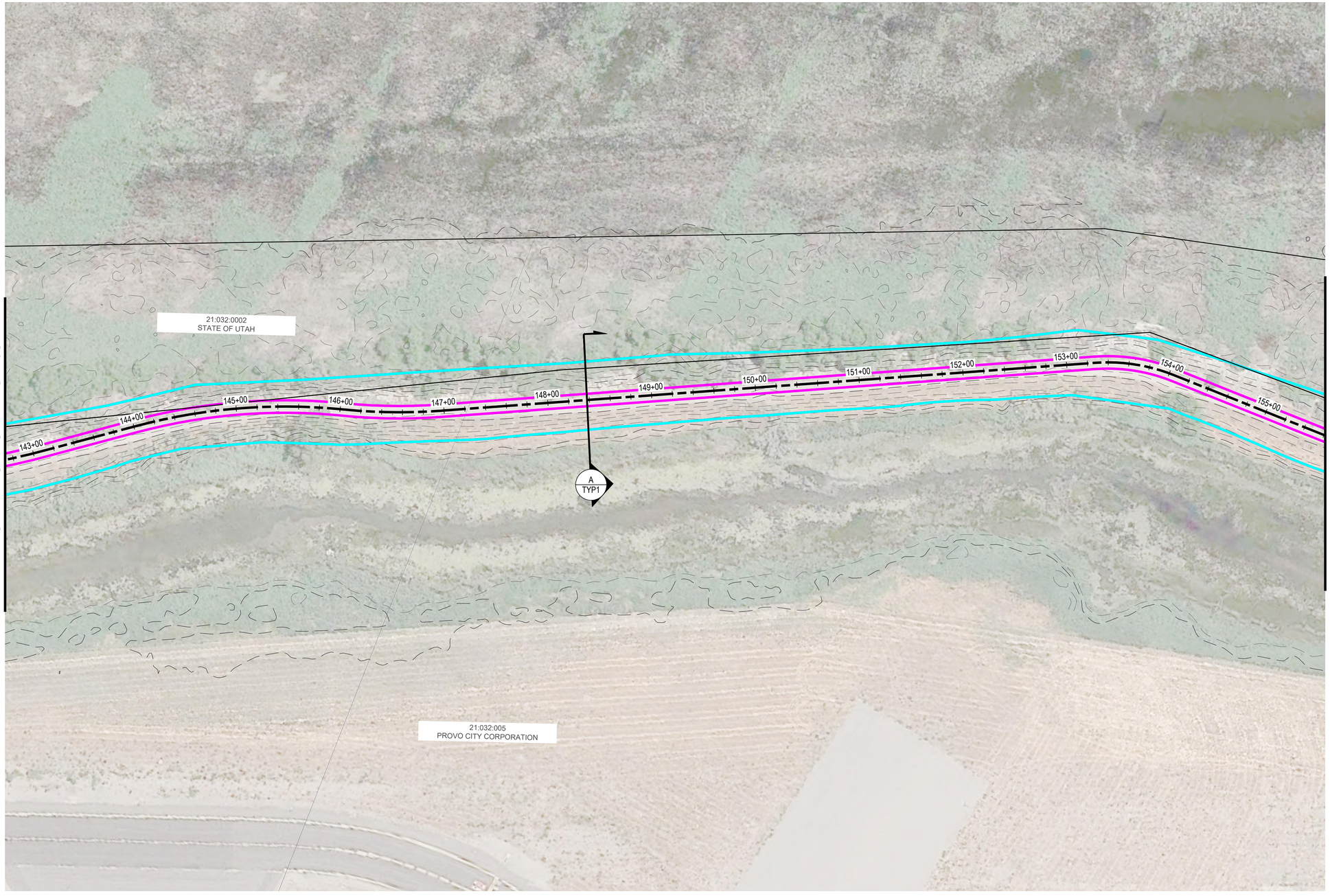
PRINCIPAL: M. HIRST, PE
PROJECT MANAGER: B. ROOD
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LAKESIDE LEVEE
LAKESIDE LEVEE PLAN

PROVO RIVER & TRAIL
PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 10 OF: 27
SHEET NUMBER: CP108



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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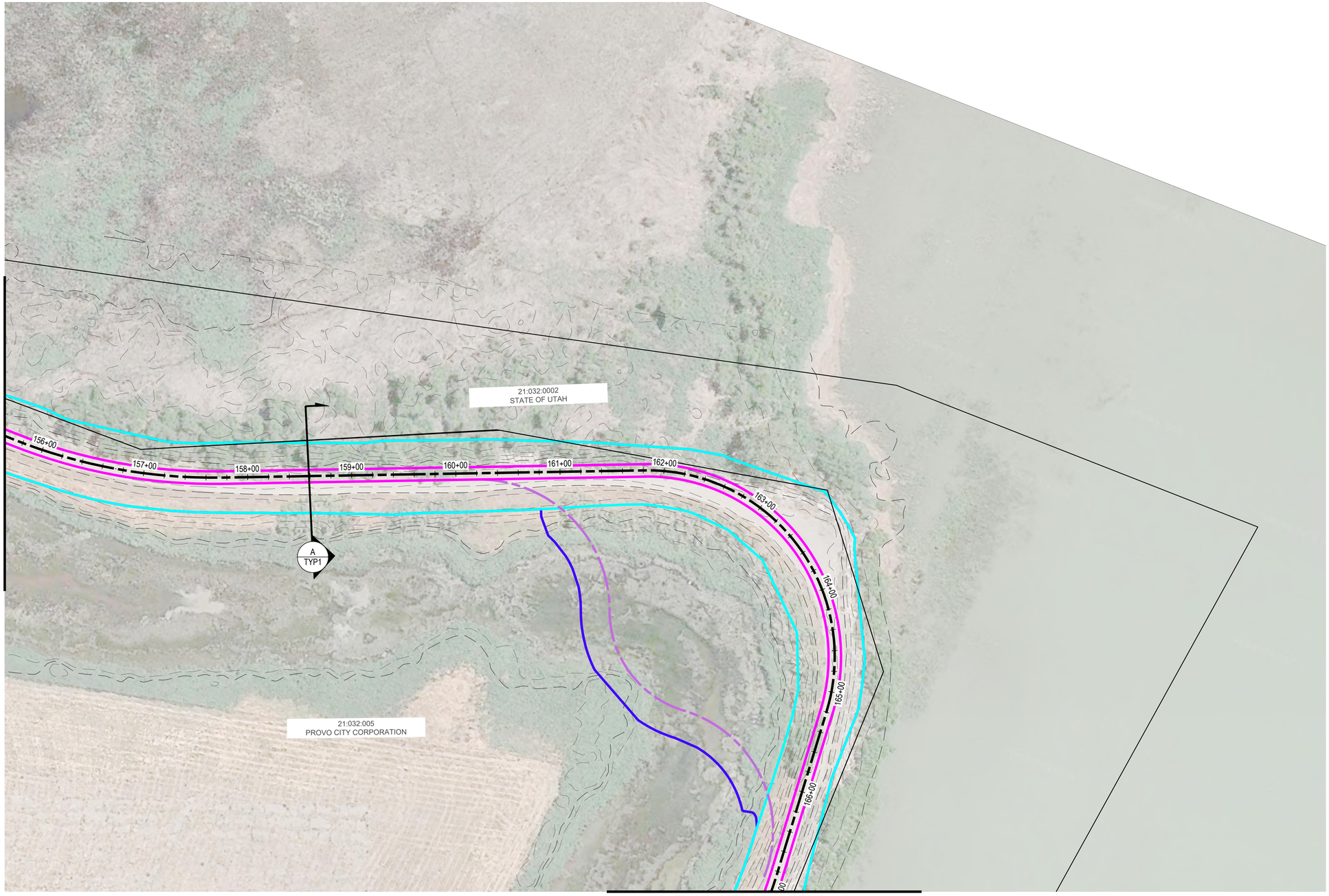
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PROJECT MANAGER: B. ROOD
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PROVO RIVER & TRAIL
PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 11 OF: 27
SHEET NUMBER: CP109



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
DRAWN BY: K. FOSTER, G. RICH
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ISSUE DATE: DEC. 2020

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PROVO RIVER & TRAIL
PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 12 OF: 27
SHEET NUMBER: CP110



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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RECORD OF REVISIONS

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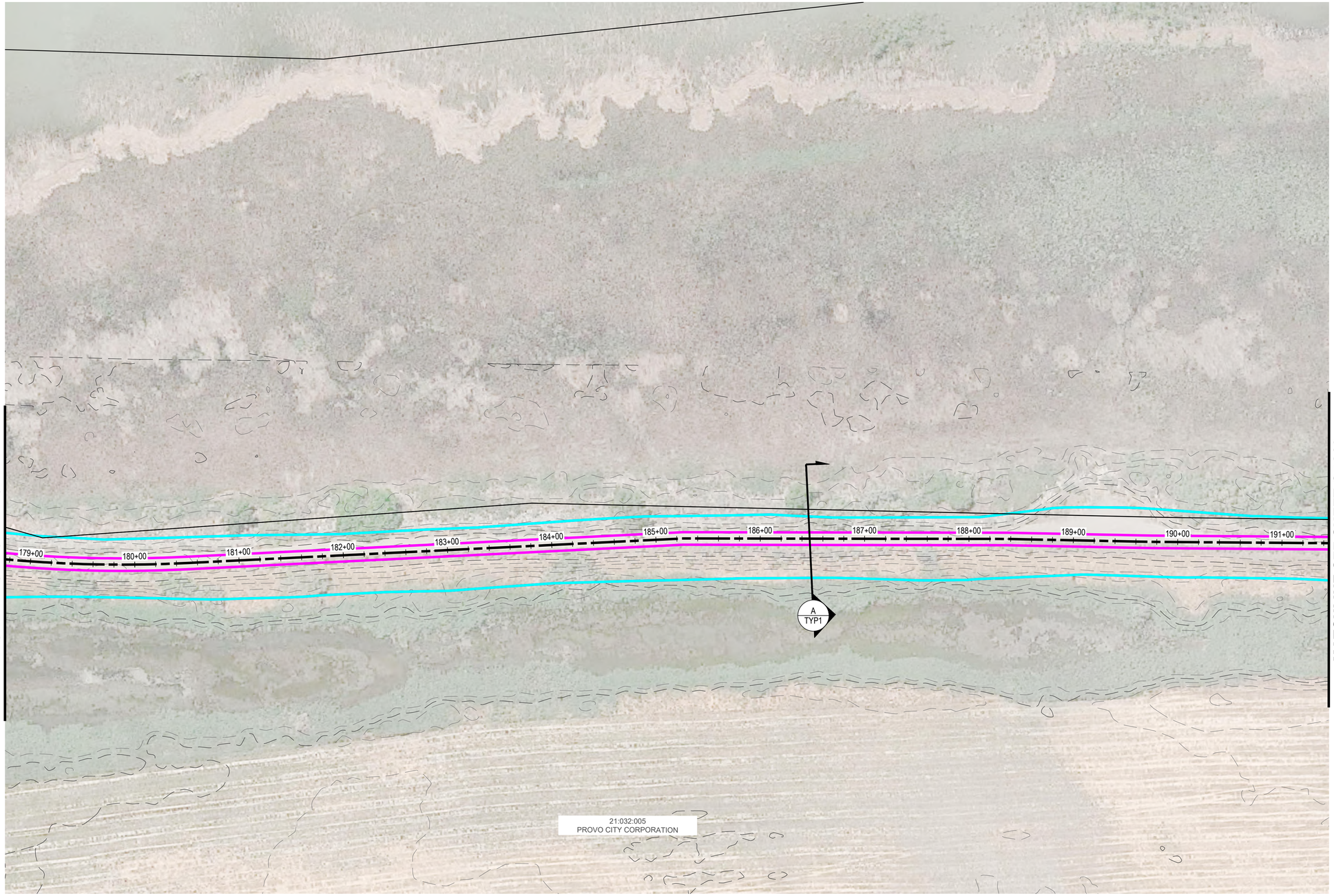
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PROJECT MANAGER: B. ROOD
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PROJECT NUMBER: 2019-0033
SHEET: 13 OF: 27
SHEET NUMBER: CP111



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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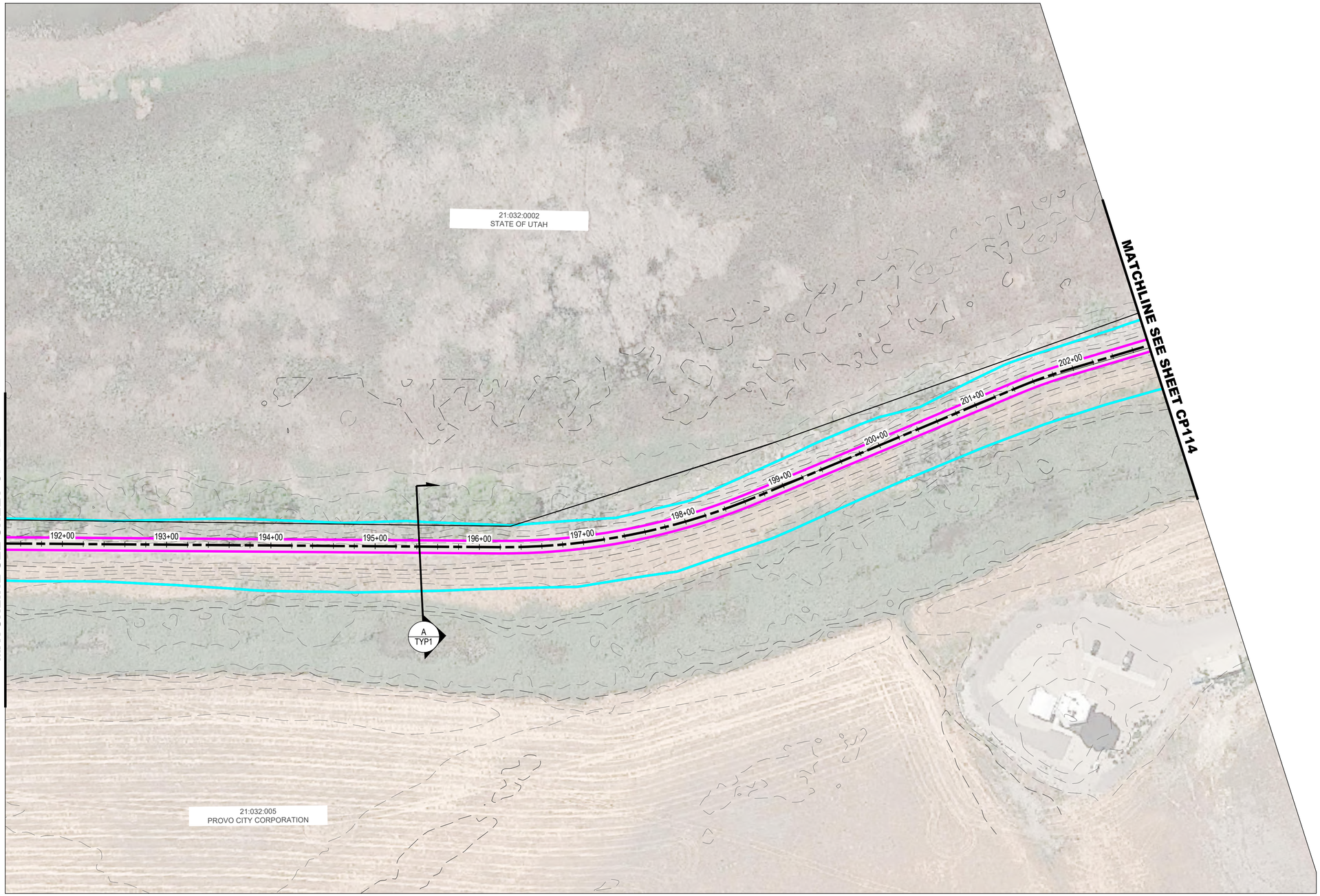
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PROJECT NUMBER: 2019-0033
SHEET: 14 OF: 27
SHEET NUMBER: CP112



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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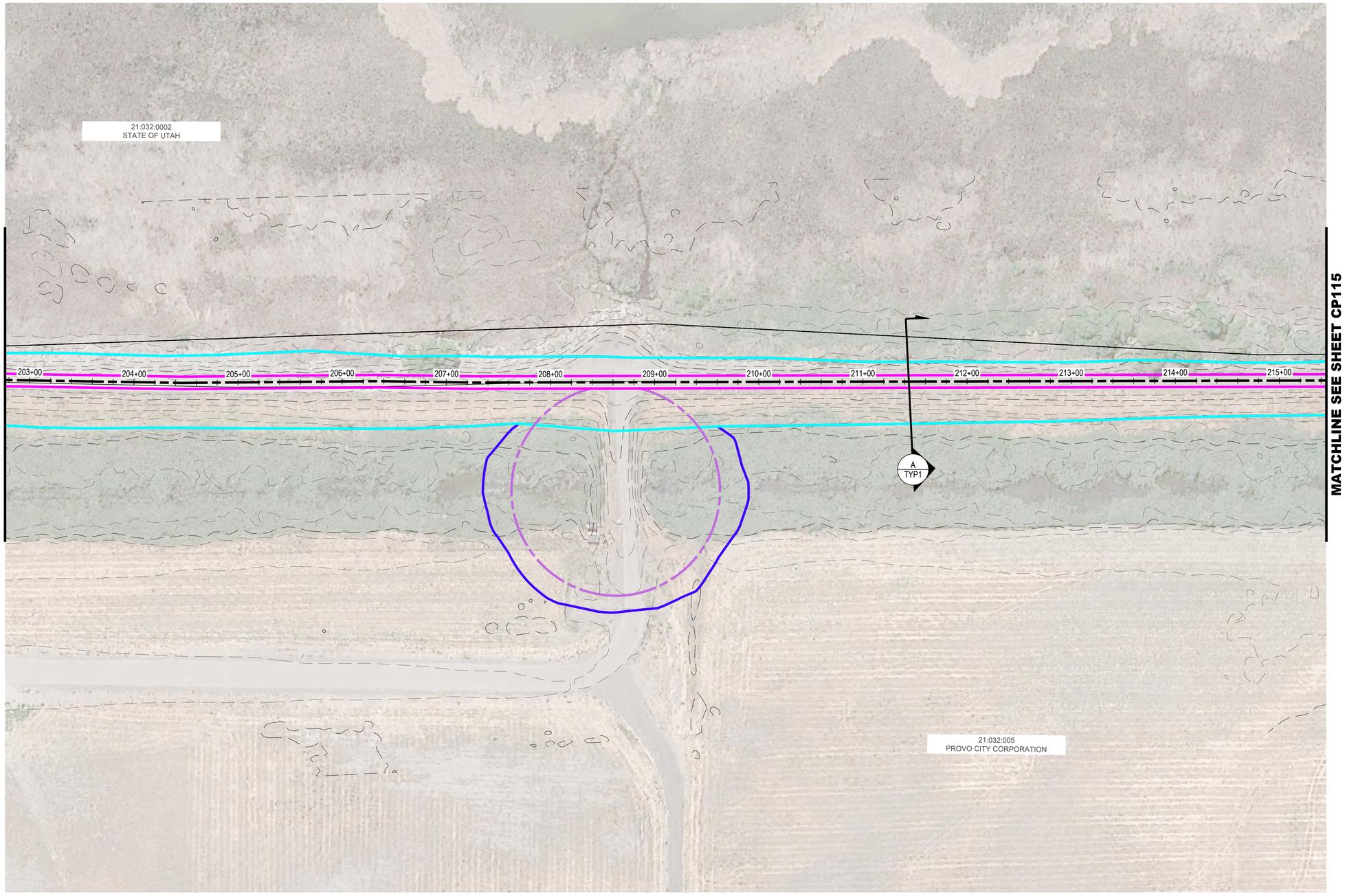
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PROJECT NUMBER	2019-0033
SHEET	15
OF	27
SHEET NUMBER	CP113





0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PROJECT NUMBER: 2019-0033
SHEET: 16 OF: 27
SHEET NUMBER: CP114



0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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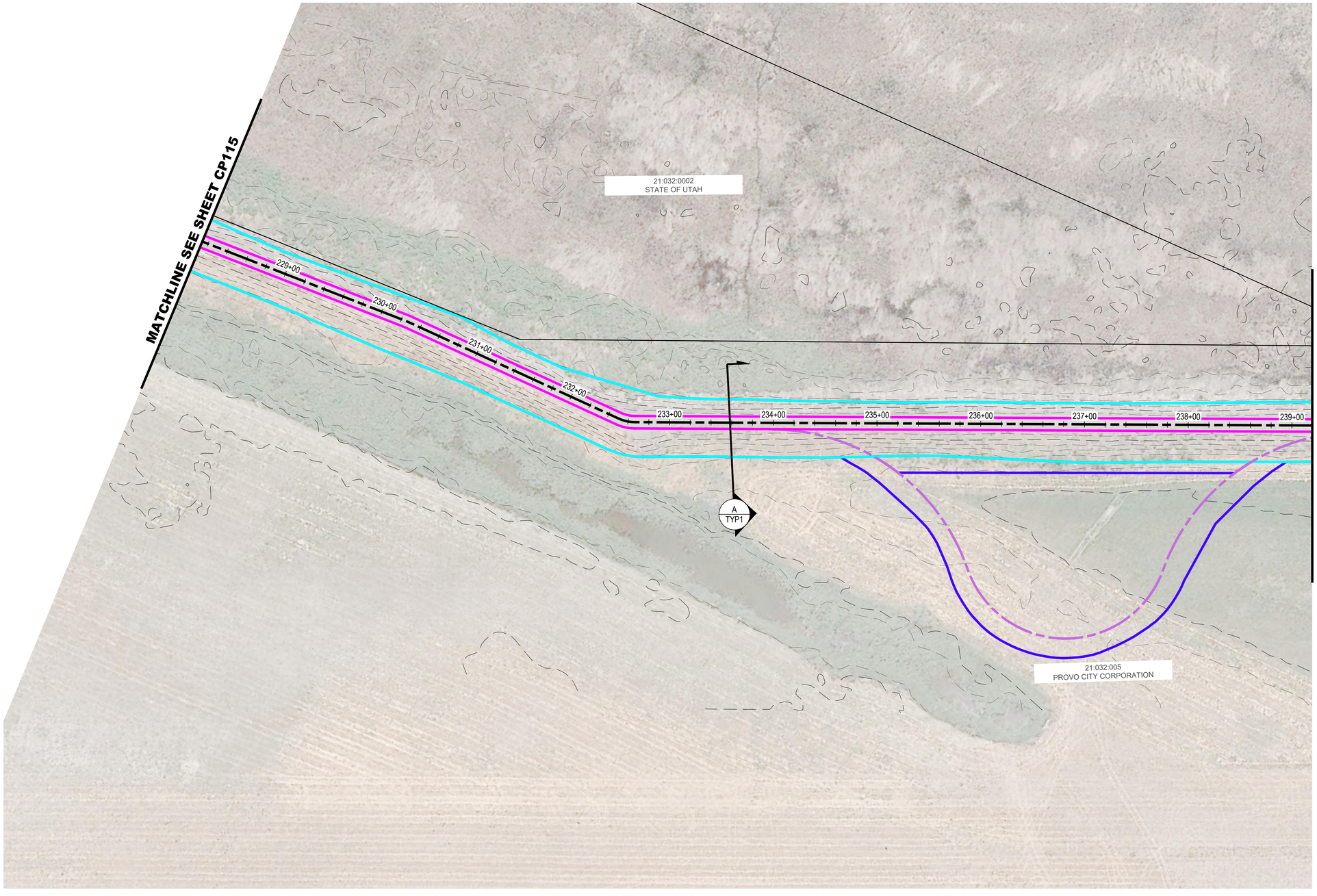
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PROJECT NUMBER: 2019-0033
SHEET: 17 OF: 27
SHEET NUMBER: CP115



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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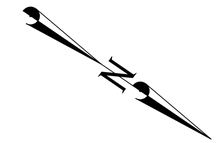
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PROJECT NUMBER: 2019-0033
SHEET: 18 OF: 27
SHEET NUMBER: CP116





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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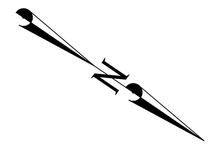
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PROJECT NUMBER: 2019-0033
SHEET: 19 OF: 27
SHEET NUMBER: CP117





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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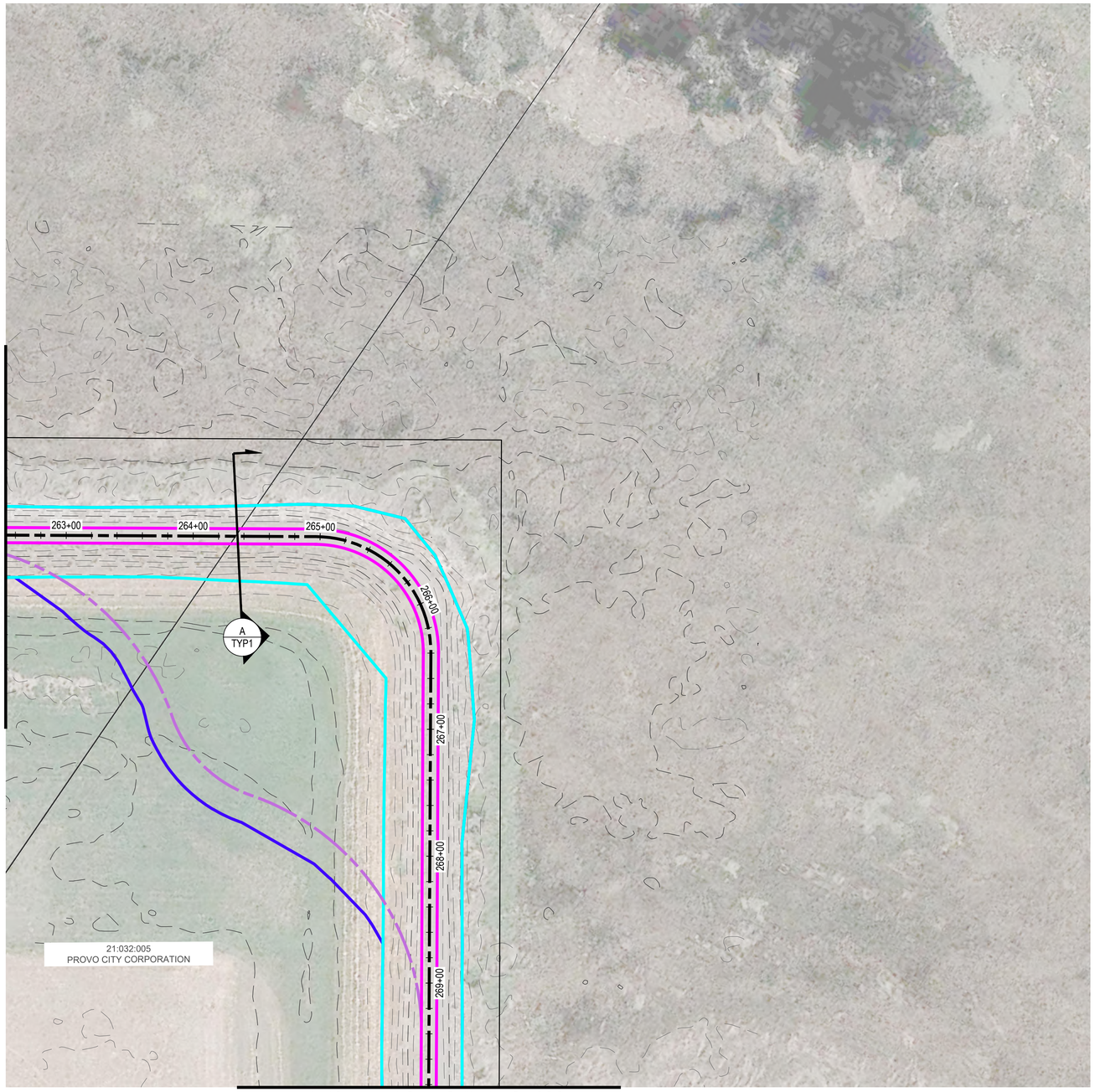
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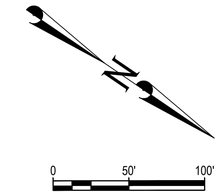
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PROJECT NUMBER: 2019-0033
SHEET: 20 OF: 27
SHEET NUMBER: CP118





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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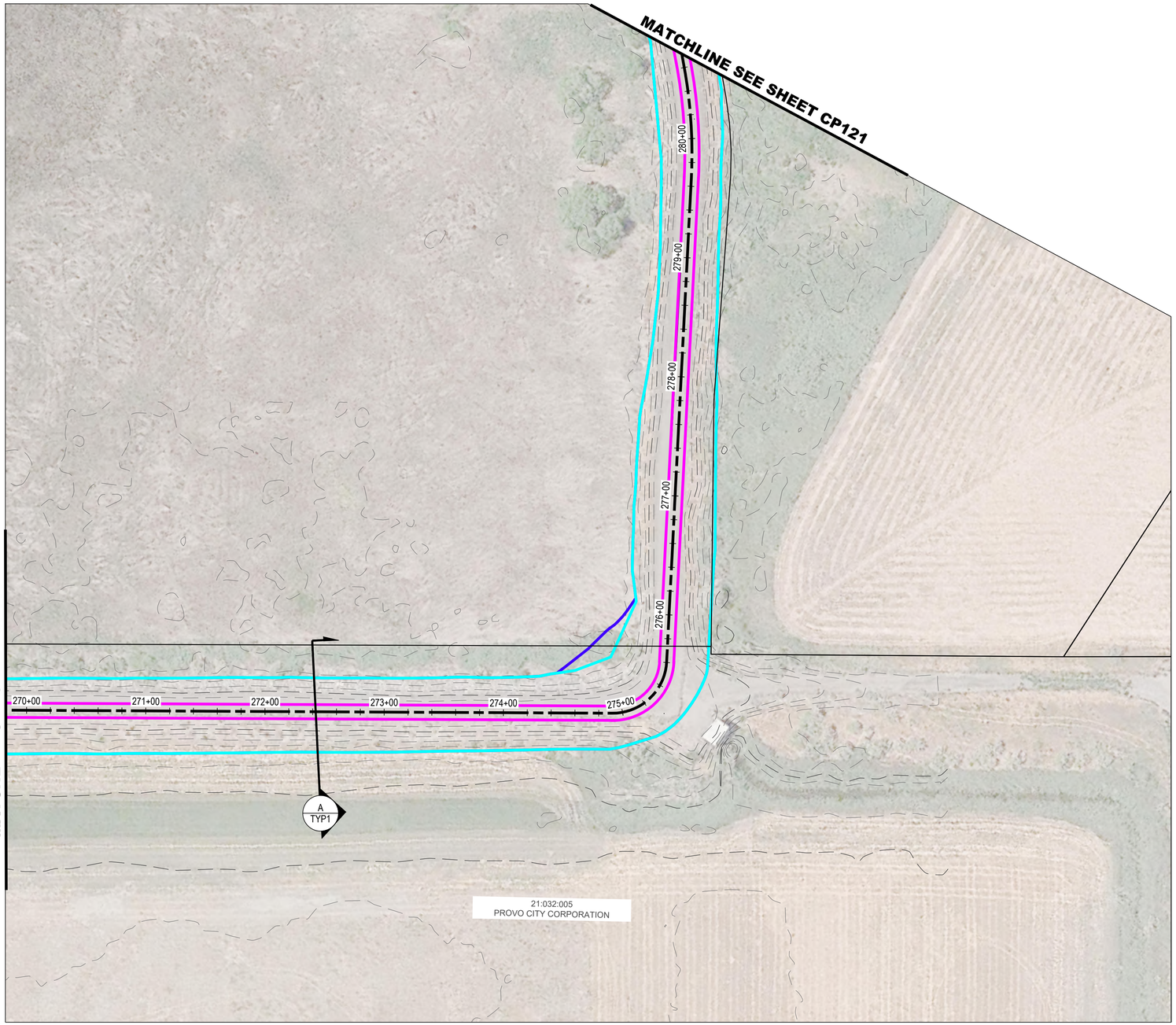
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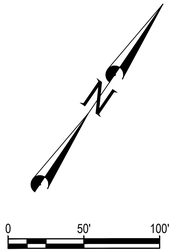
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PROJECT NUMBER: 2019-0033
SHEET: 21 OF: 27
SHEET NUMBER: CP119





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PROJECT NUMBER: 2019-0033
SHEET: 22 OF: 27
SHEET NUMBER: CP120



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PROJECT NUMBER: 2019-0033
SHEET: 23 OF: 27
SHEET NUMBER: CP121



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PROJECT MANAGER	B. ROOD
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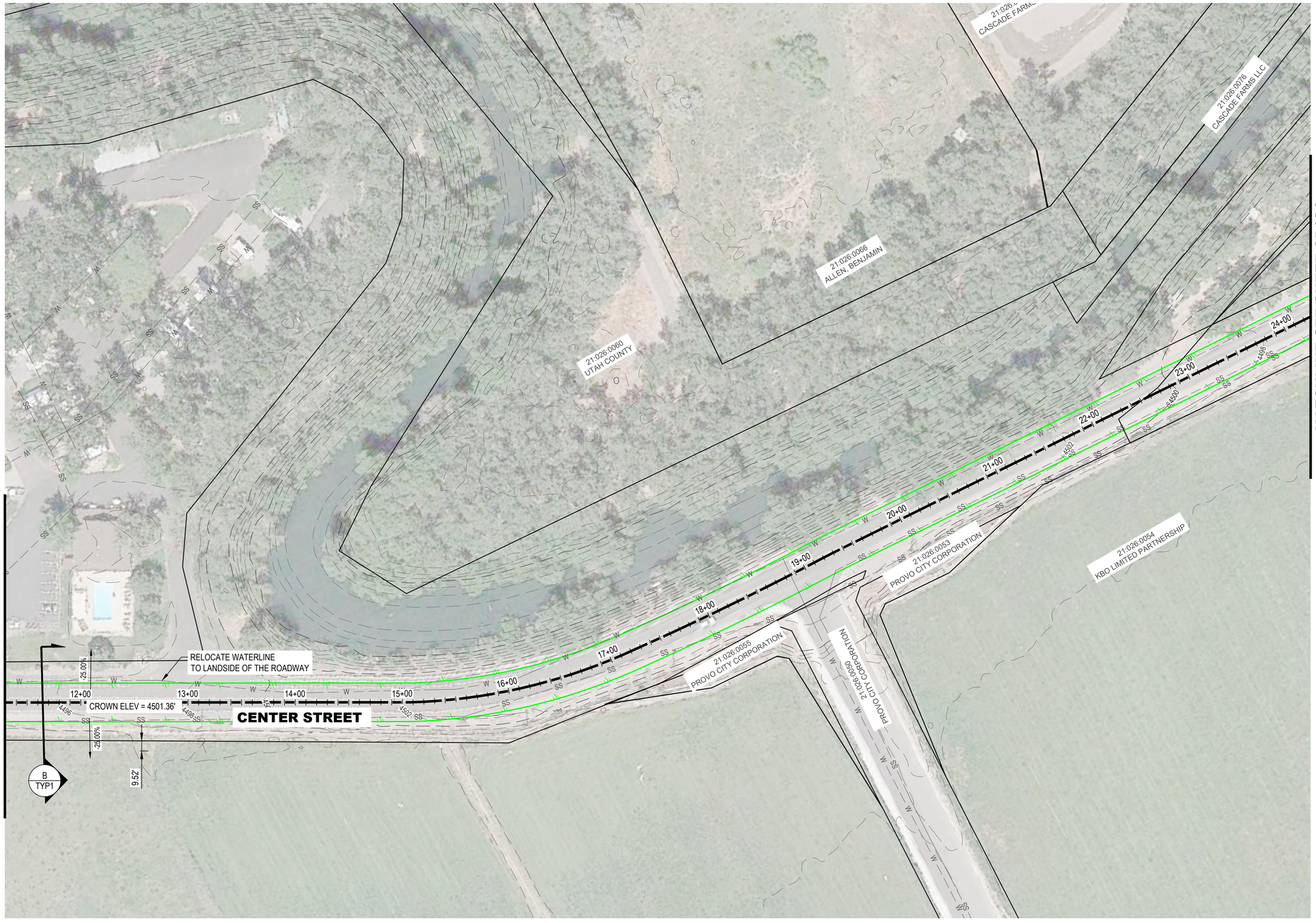
PROVO CITY
LAKESIDE LEVEE
CENTER STREET LEVEE PLAN

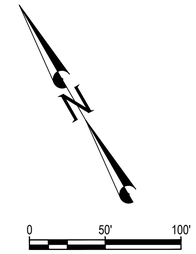
PROVO RIVER & TRAIL — PROVO, UTAH

PROJECT NUMBER 2019-0033

SHEET 24 OF 27

SHEET NUMBER CP122





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

File Path:P:\2019-0033 Provo-West Side Levee Plan\Drawings\SHEETS\LOWER RIVER LEVEE SHEETS.dwg Apr 13, 2021 - 9:54am

RECORD OF REVISIONS

0 1 2

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PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER, G. RICH
DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

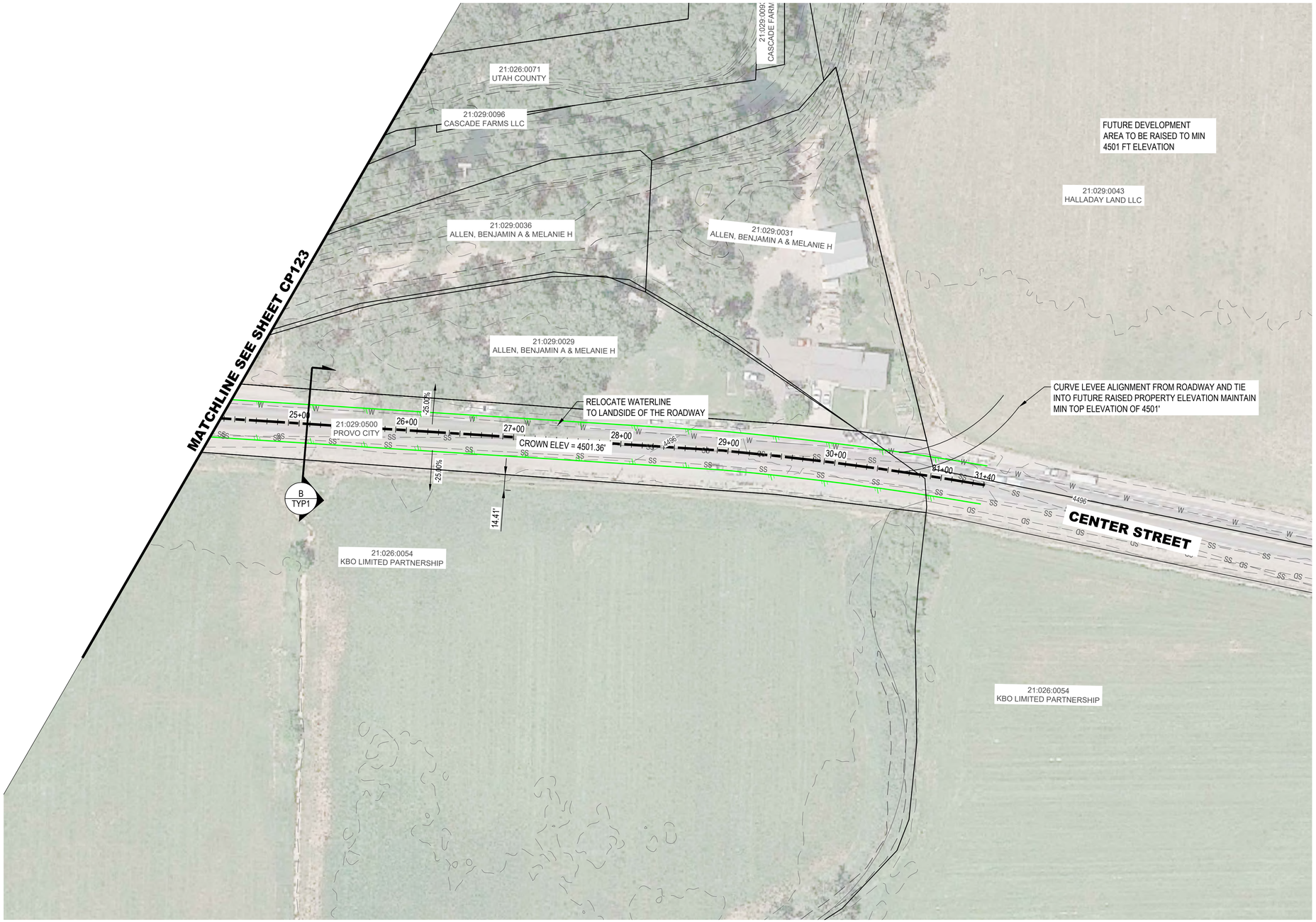
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PROVO CITY
LAKESIDE LEVEE
CENTER STREET LEVEE PLAN

PROVO RIVER & TRAIL

PROVO, UTAH

PROJECT NUMBER	2019-0033
SHEET	25
OF	27
SHEET NUMBER	CP123



0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

File Path:P:\2019-0033 Provo West Side Levee Plan\Drawings\SHEETS\LOWER RIVER LEVEE SHEETS.dwg Apr 13, 2021 - 9:54am

RECORD OF REVISIONS

0 1 2

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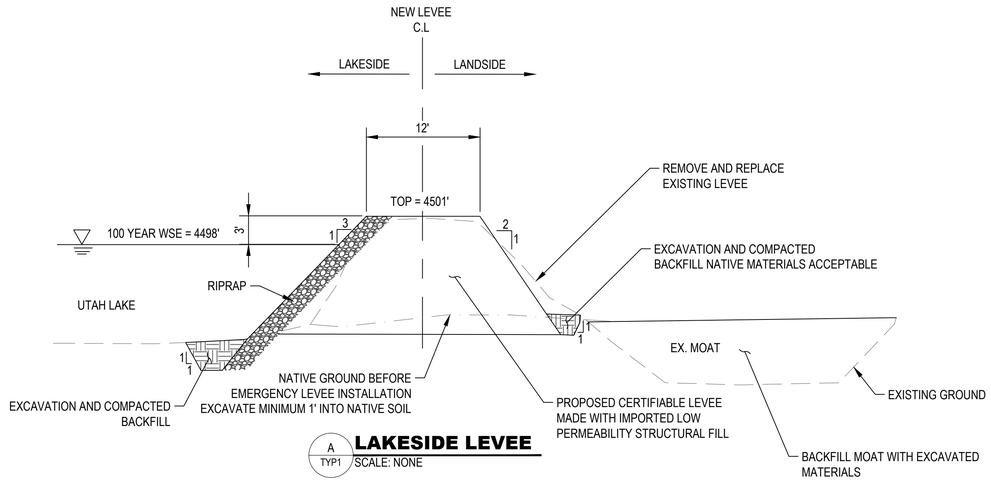
PRINCIPAL: M. HIRST, PE
PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
DRAWN BY: K. FOSTER, G. RICH
DRAWING SCALE: AS SHOWN
ISSUE DATE: DEC. 2020

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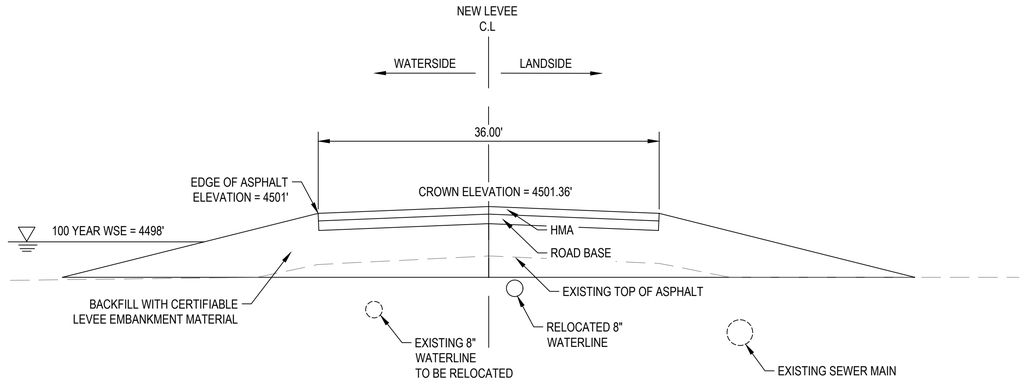
PROVO CITY
LAKESIDE LEVEE
CENTER STREET LEVEE PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 26 OF: 27
SHEET NUMBER: CP124



A / TYP1 **LAKESIDE LEVEE**
SCALE: NONE



B / TYP1 **CENTER STREET LEVEE**
SCALE: NONE

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RECORD OF REVISIONS

0 1 2

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PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER, G. RICH
DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

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PROVO CITY
LAKESIDE LEVEE
TYPICAL LEVEE DETAILS

PROVO RIVER & TRAIL — PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 27 OF: 27
SHEET NUMBER: TYP1

PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
CONCEPTUAL NFC DESIGN

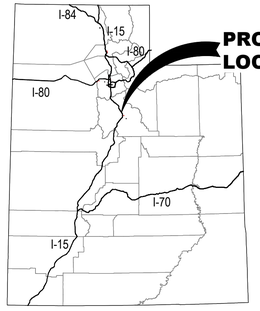
PROVO RIVER & TRAIL
PROVO, UTAH

ISSUE DATE: DEC. 2020



PROJECT VICINITY MAP
N.T.S.

STATE OF UTAH



LEGEND

MAJOR HIGHWAY
COUNTY LINE

SHEET LIST TABLE		
SHEET	SHEET TITLE	SHEET DESCRIPTION
1	G001	TITLE SHEET
2	CP100	RIVERSIDE LEVEES SHEET KEY
3	A1-CP101	ALT 1 RIVER PLAN
4	A1-CP102	ALT 1 RIVER PLAN
5	A1-CP103	ALT 1 RIVER PLAN
6	A1-CP104	ALT 1 RIVER PLAN
7	A1-CP105	ALT 1 RIVER PLAN
8	A1-CP106	ALT 1 RIVER PLAN
9	A1-TYP1	ALT1 TYPICAL DETAILS
10	A2A-CP101	ALT 2A RIVER PLAN
11	A2A-CP102	ALT 2A RIVER PLAN
12	A2A-CP103	ALT 2A RIVER PLAN
13	A2A-CP104	ALT 2A RIVER PLAN
14	A2A-CP105	ALT 2A RIVER PLAN
15	A2A-CP106	ALT 2A RIVER PLAN
16	A2A-TYP1	ALT2A TYPICAL DETAILS
17	A2B-CP101	ALT2B RIVER PLAN
18	A2B-CP102	ALT2B RIVER PLAN
19	A2B-CP103	ALT2B RIVER PLAN
20	A2B-CP104	ALT2B RIVER PLAN
21	A2B-CP105	ALT2B RIVER PLAN
22	A2B-CP106	ALT2B RIVER PLAN
23	A2B-TYP1	ALT2B TYPICAL DETAILS

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RECORD OF REVISIONS

0 1 2

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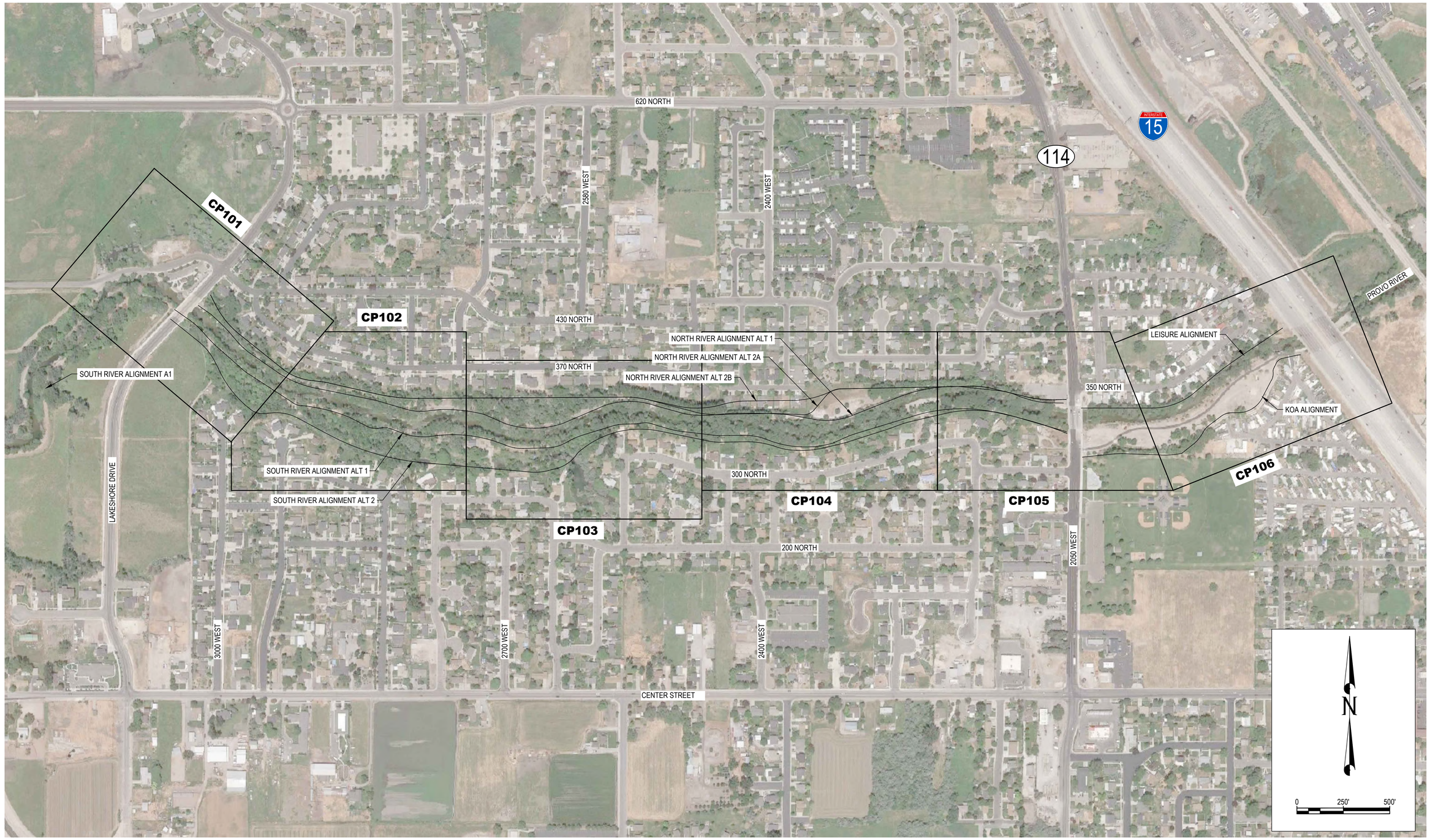
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PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
DRAWN BY: K. FOSTER
DRAWING SCALE: AS SHOWN
ISSUE DATE: DEC. 2020

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PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
TITLE SHEET

PROVO RIVER & TRAIL PROVO, UTAH

PROJECT NUMBER: 2019-0033
SHEET: 1 OF: 23
SHEET NUMBER: G001



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RECORD OF REVISIONS			

0 1 2

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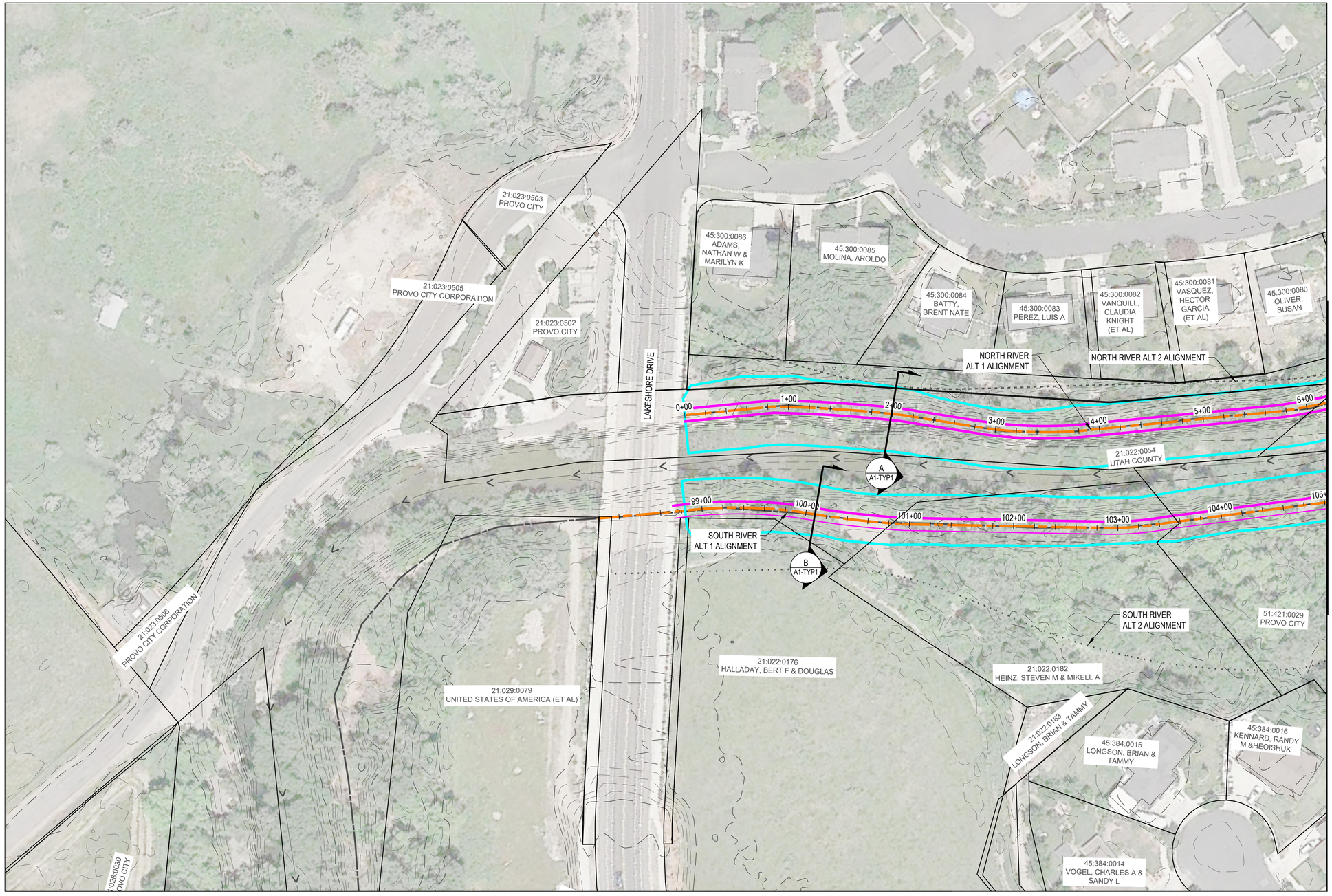
PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
RIVERSIDE LEVEES SHEET KEY

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER	
2019-0033	
SHEET	OF
2	23

SHEET NUMBER
CP100



N

0 20' 40'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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RECORD OF REVISIONS

0 1 2

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PROJECT MANAGER: B. ROOD
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DRAWN BY: K. FOSTER
DRAWING SCALE: AS SHOWN
ISSUE DATE: DEC. 2020

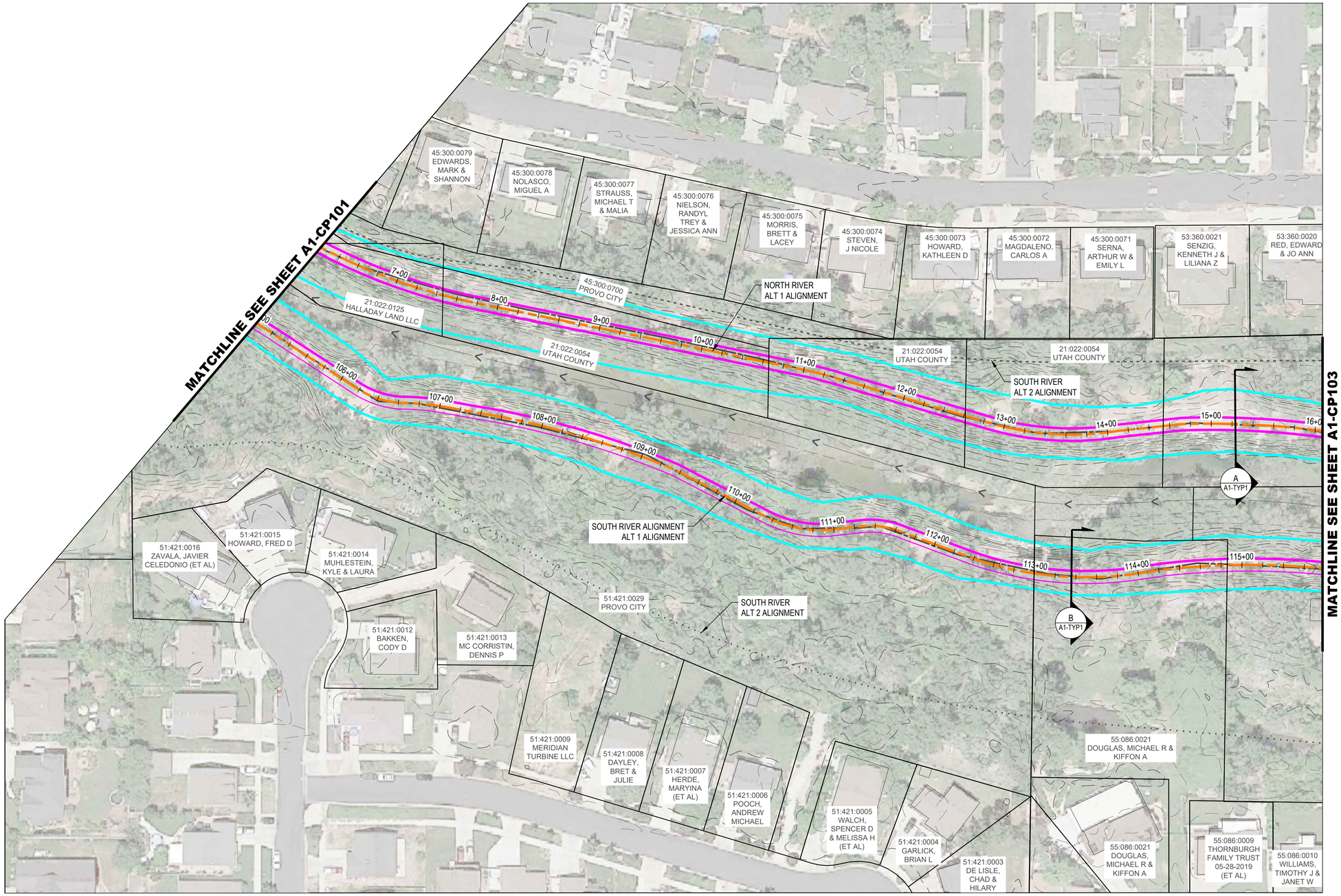
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PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
ALT 1 RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER: 2019-0033
SHEET: 3 OF: 23
SHEET NUMBER: A1-CP101



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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RECORD OF REVISIONS

0 1 2

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DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

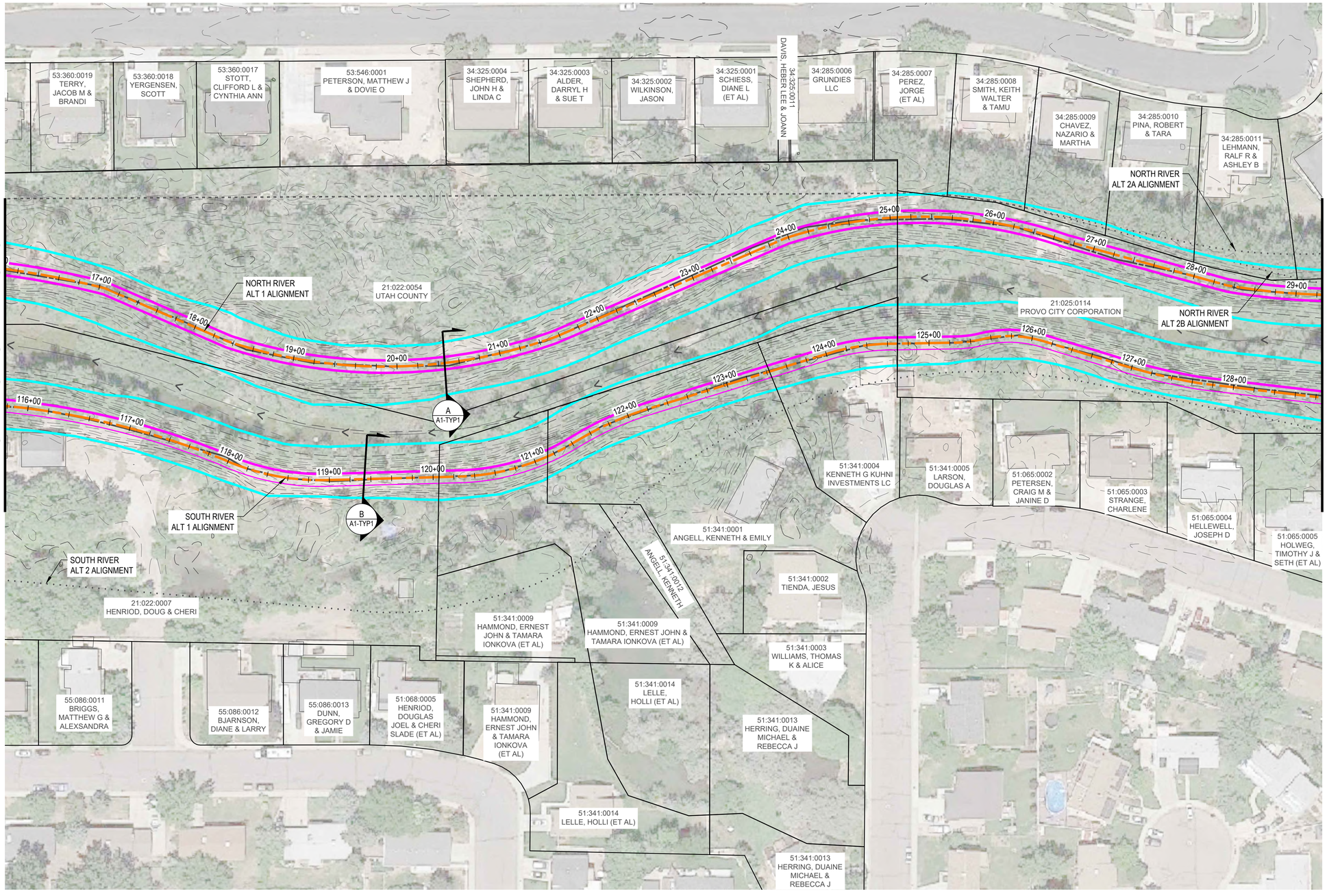
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PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
ALT 1 RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER	2019-0033
SHEET	4
OF	23
SHEET NUMBER	A1-CP102



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RECORD OF REVISIONS

0 1 2

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PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER
DRAWING SCALE	AS SHOWN
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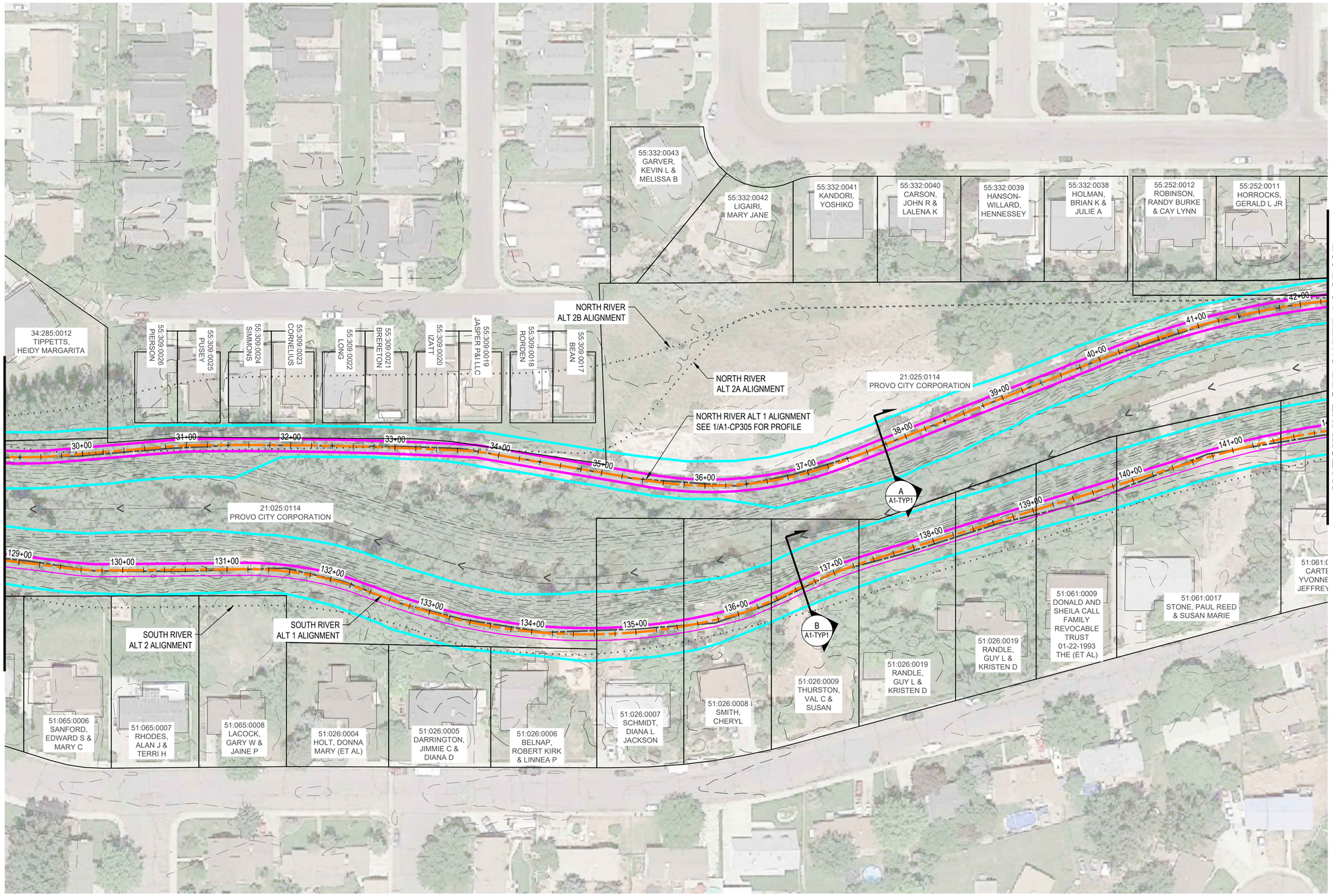
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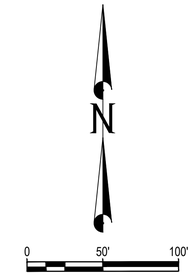
PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
ALT 1 RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER	2019-0033
SHEET	5
OF	23
SHEET NUMBER	A1-CP103





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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RECORD OF REVISIONS

0 1 2

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PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
DRAWN BY: K. FOSTER
DRAWING SCALE: AS SHOWN
ISSUE DATE: DEC. 2020

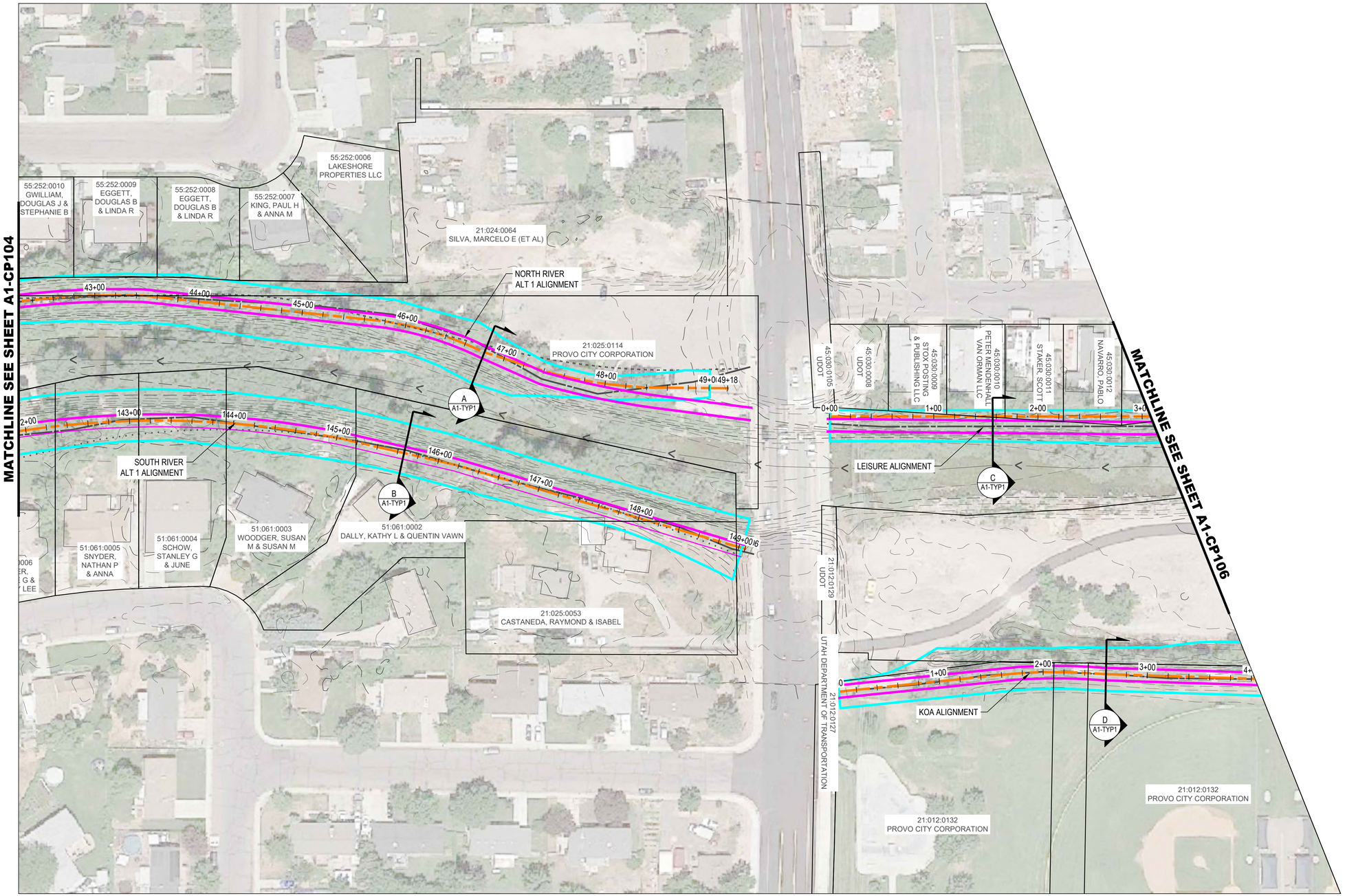
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PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
ALT 1 RIVER PLAN

PROVO RIVER & TRAIL
PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER: 2019-0033
SHEET: 6 OF: 23
SHEET NUMBER: A1-CP104



LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- EX MAJOR CONTOUR (4200)
- EX MINOR CONTOUR (4202)
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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0 1 2

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PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER
DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

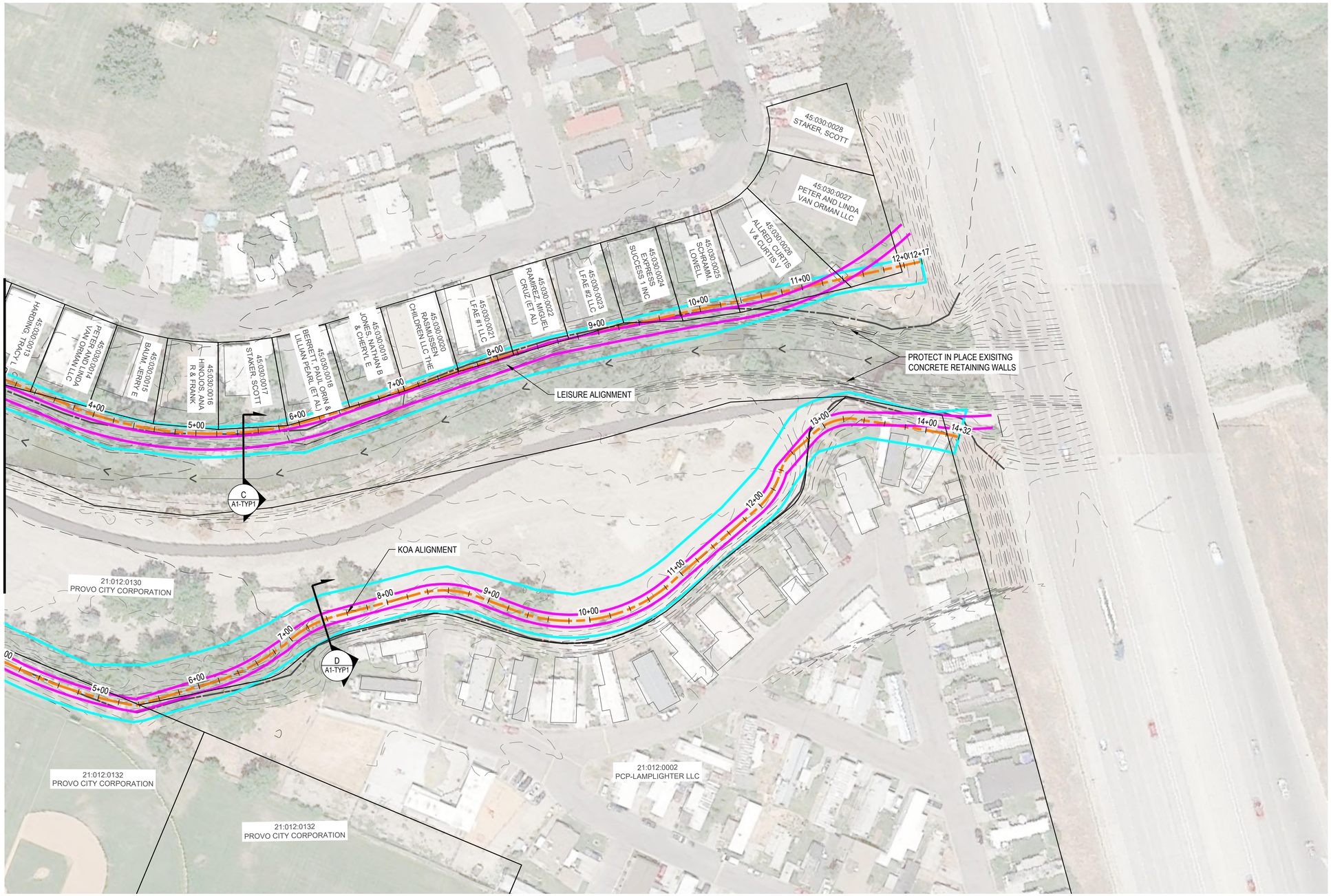
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PROVO RIVER LEVEE ALTERNATIVES
ALT 1 RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER 2019-0033
SHEET 7 OF 23
SHEET NUMBER A1-CP105



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- EX MAJOR CONTOUR (4200)
- EX MINOR CONTOUR (4202)
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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RECORD OF REVISIONS

0 1 2

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PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER
DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

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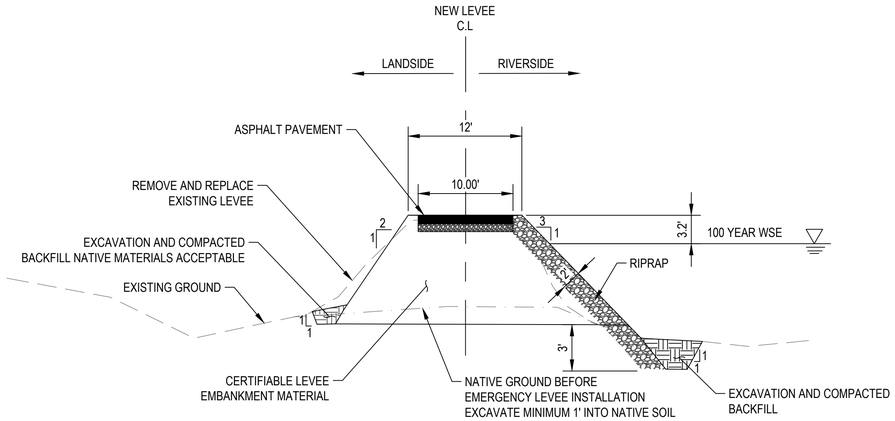
PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
ALT 1 RIVER PLAN

PROVO RIVER & TRAIL

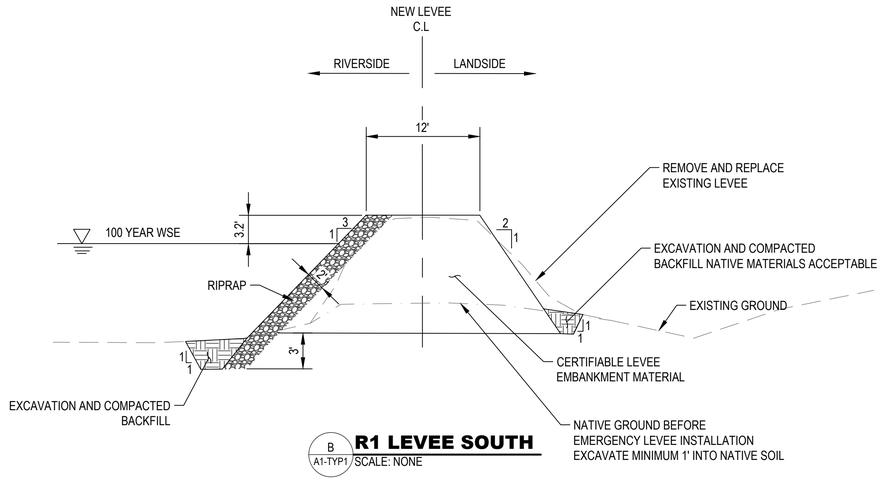
PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

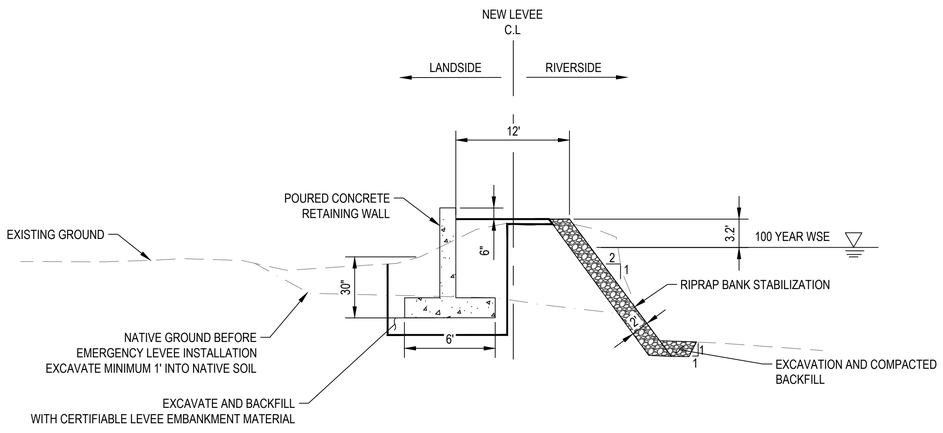
PROJECT NUMBER	2019-0033
SHEET	8
OF	23
SHEET NUMBER	A1-CP106



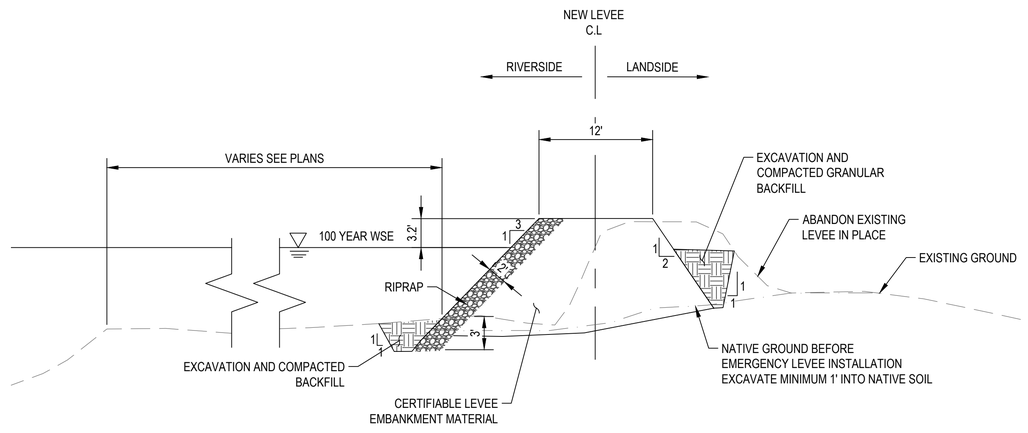
A A1-TYP1 **R1 LEVEE NORTH**
SCALE: NONE



B A1-TYP1 **R1 LEVEE SOUTH**
SCALE: NONE



C A1-TYP1 **LEISURE VILLAGE LEVEE**
SCALE: NONE



D A1-TYP1 **KOA LEVEE SOUTH**
SCALE: NONE

NOTE:

IN CERTAIN AREAS EXISTING RIVER BANK SLOPES ARE VERY STEEP CAUSING THE IMPLEMENTATION OF THE STABLE 3:1 RIVERSIDE SLOPE TO SIGNIFICANTLY ALTER THE RIVER GEOMETRY. IN THESE AREAS BANK STABILIZATION METHODS TO ACHIEVE STEEPER SLOPES WILL NEED TO BE IMPLEMENTED

File Path:P:\2019-0033 provo-west side levee plain\Drawings\SHEET S\TYPICAL LEVEE DETAILS.dwg Feb 26, 2021 - 9:18am

RECORD OF REVISIONS

0 1 2

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PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER
DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

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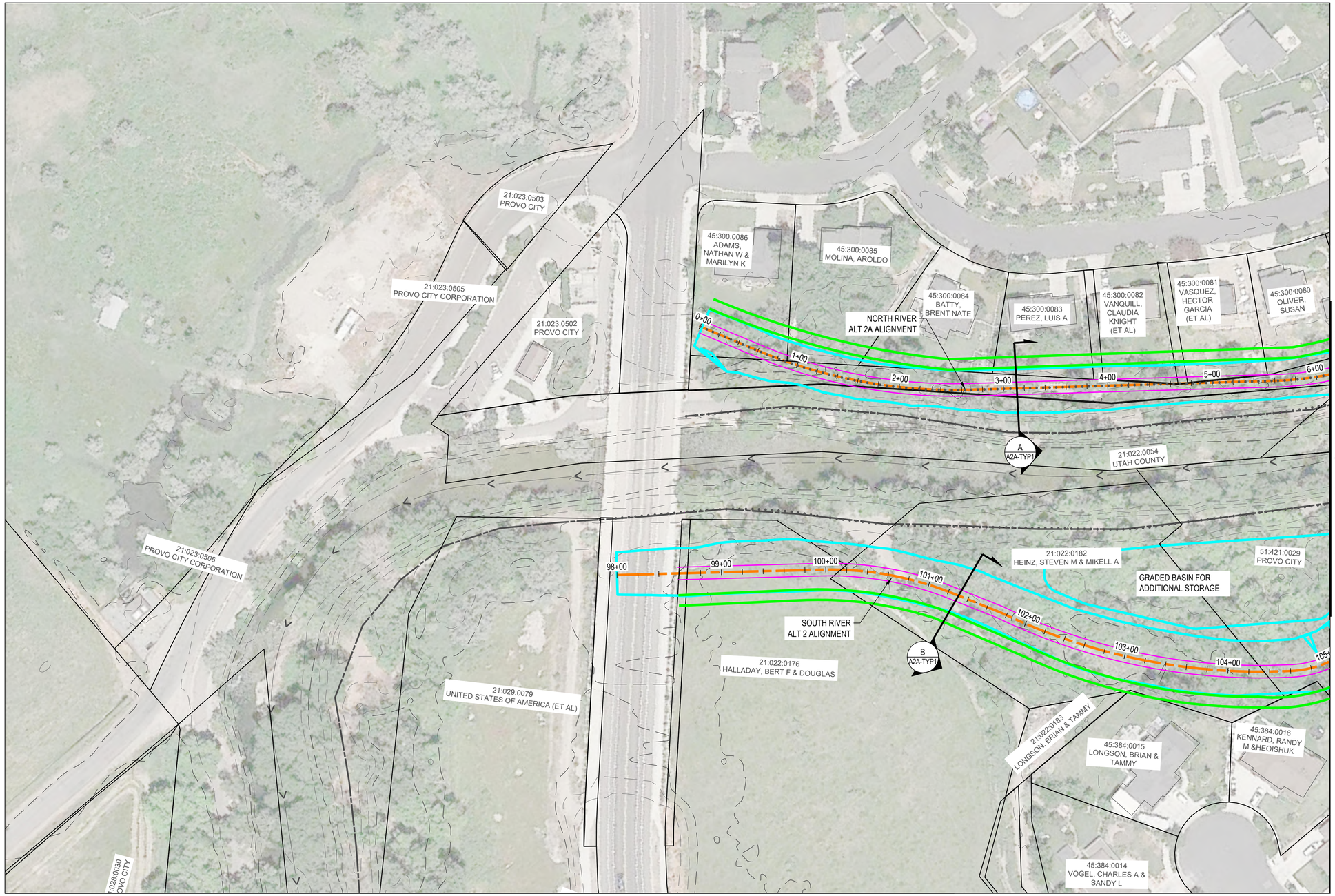
PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
ALT1 TYPICAL DETAILS

PROVO RIVER & TRAIL

PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER	2019-0033
SHEET	9
OF	23
SHEET NUMBER	A1-TYP1



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
DRAWN BY: K. FOSTER
DRAWING SCALE: AS SHOWN
ISSUE DATE: DEC. 2020

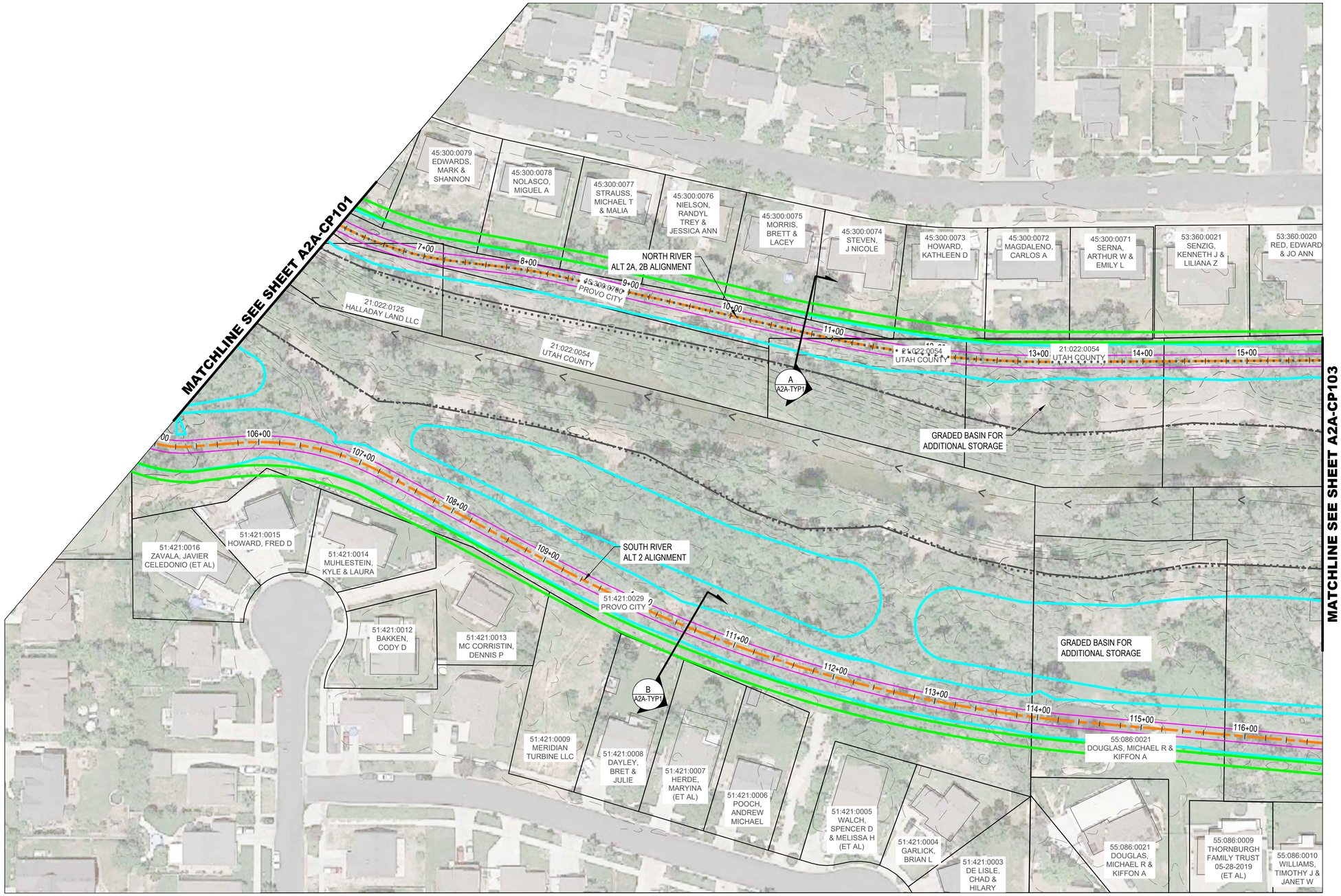
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PROVO CITY
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ALT 2A RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER: 2019-0033
SHEET: 10 OF: 23
SHEET NUMBER: A2A-CP101



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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RECORD OF REVISIONS

0 1 2

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PRINCIPAL	M. HIRST, PE
PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER
DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

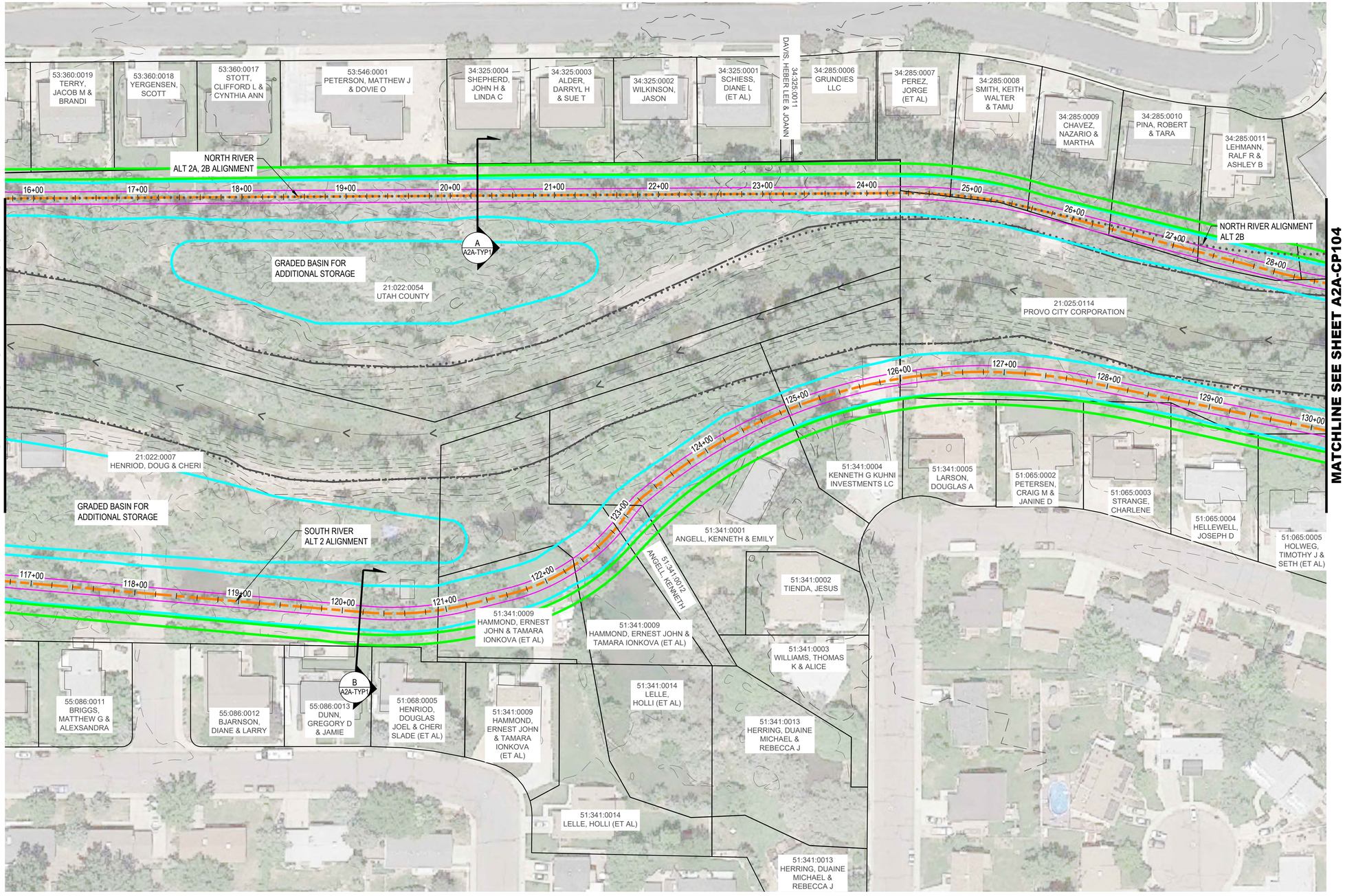
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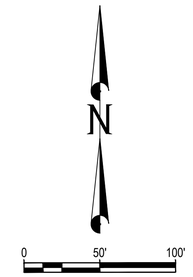
PROVO CITY
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ALT 2A RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER	2019-0033
SHEET	11
OF	23
SHEET NUMBER	A2A-CP102





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PROJECT MANAGER	B. ROOD
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DRAWN BY	K. FOSTER
DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

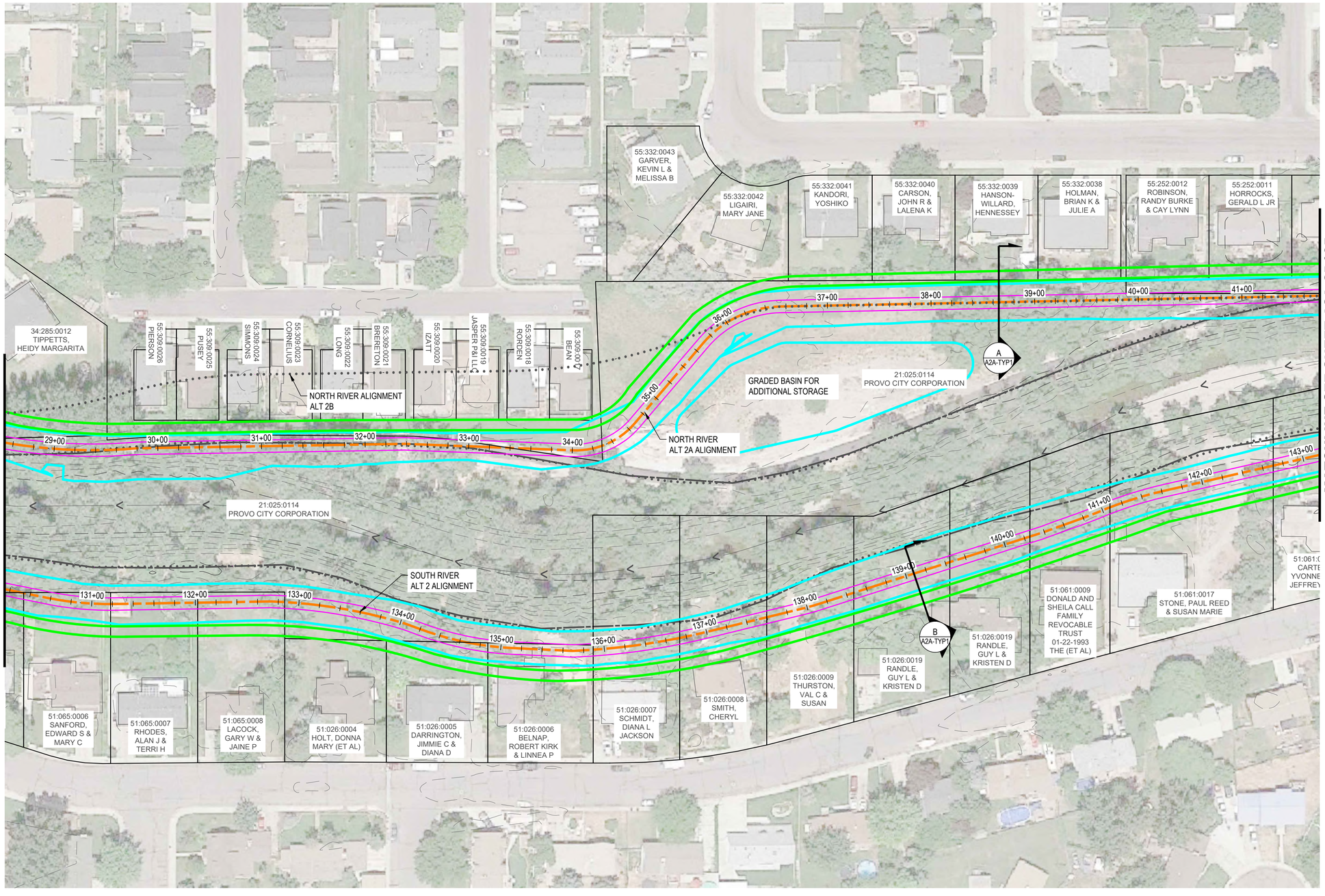
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ALT 2A RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER	2019-0033
SHEET	12
OF	23
SHEET NUMBER	A2A-CP103



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PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
DRAWN BY: K. FOSTER
DRAWING SCALE: AS SHOWN
ISSUE DATE: DEC. 2020

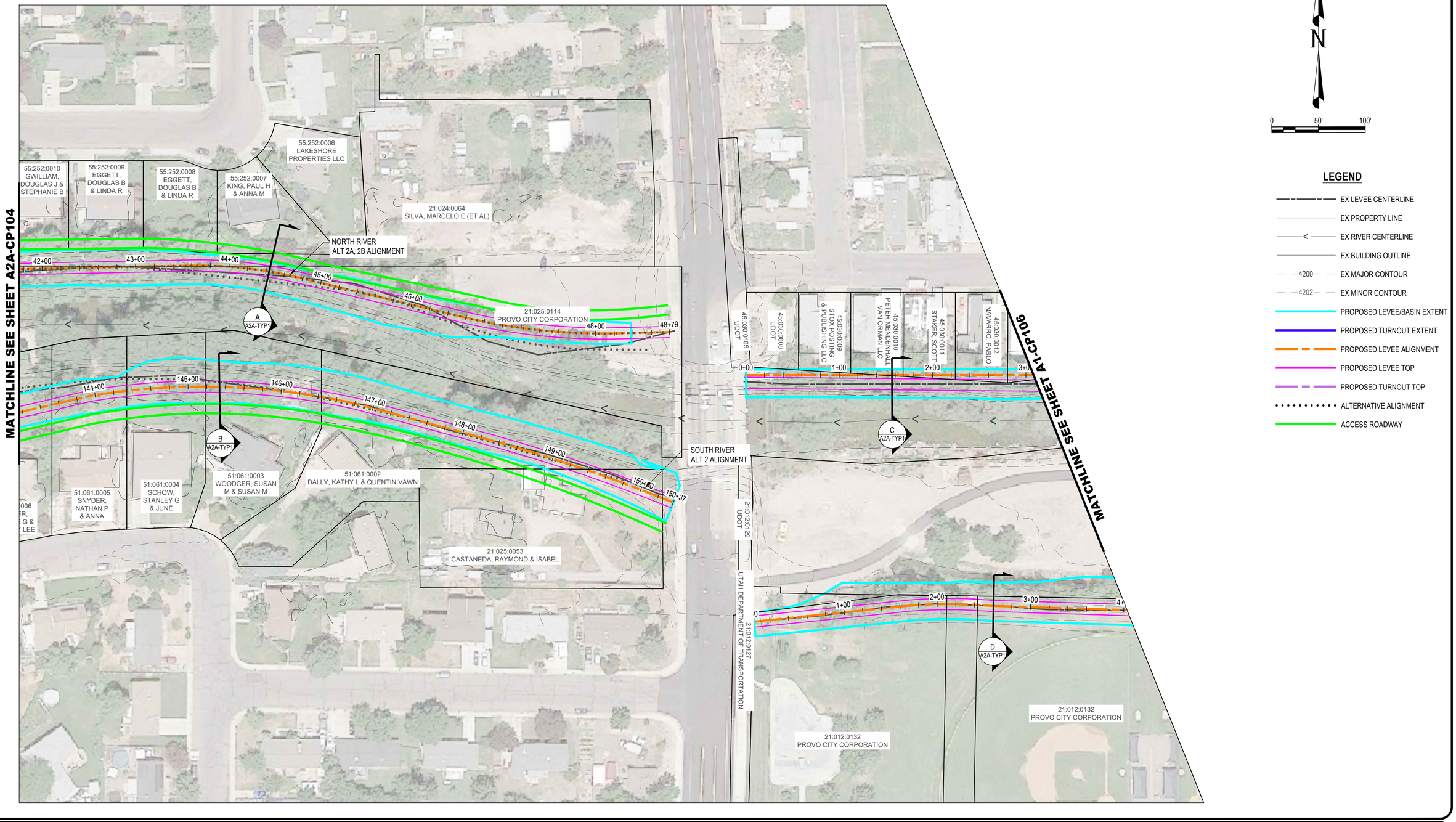
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ALT 2A RIVER PLAN

PROVO RIVER & TRAIL
PROVO, UTAH

CONCEPTUAL DESIGN
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PROJECT NUMBER: 2019-0033
SHEET: 13 OF: 23
SHEET NUMBER: A2A-CP104



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RECORD OF REVISIONS

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PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
DRAWN BY: K. FOSTER
DRAWING SCALE: AS SHOWN
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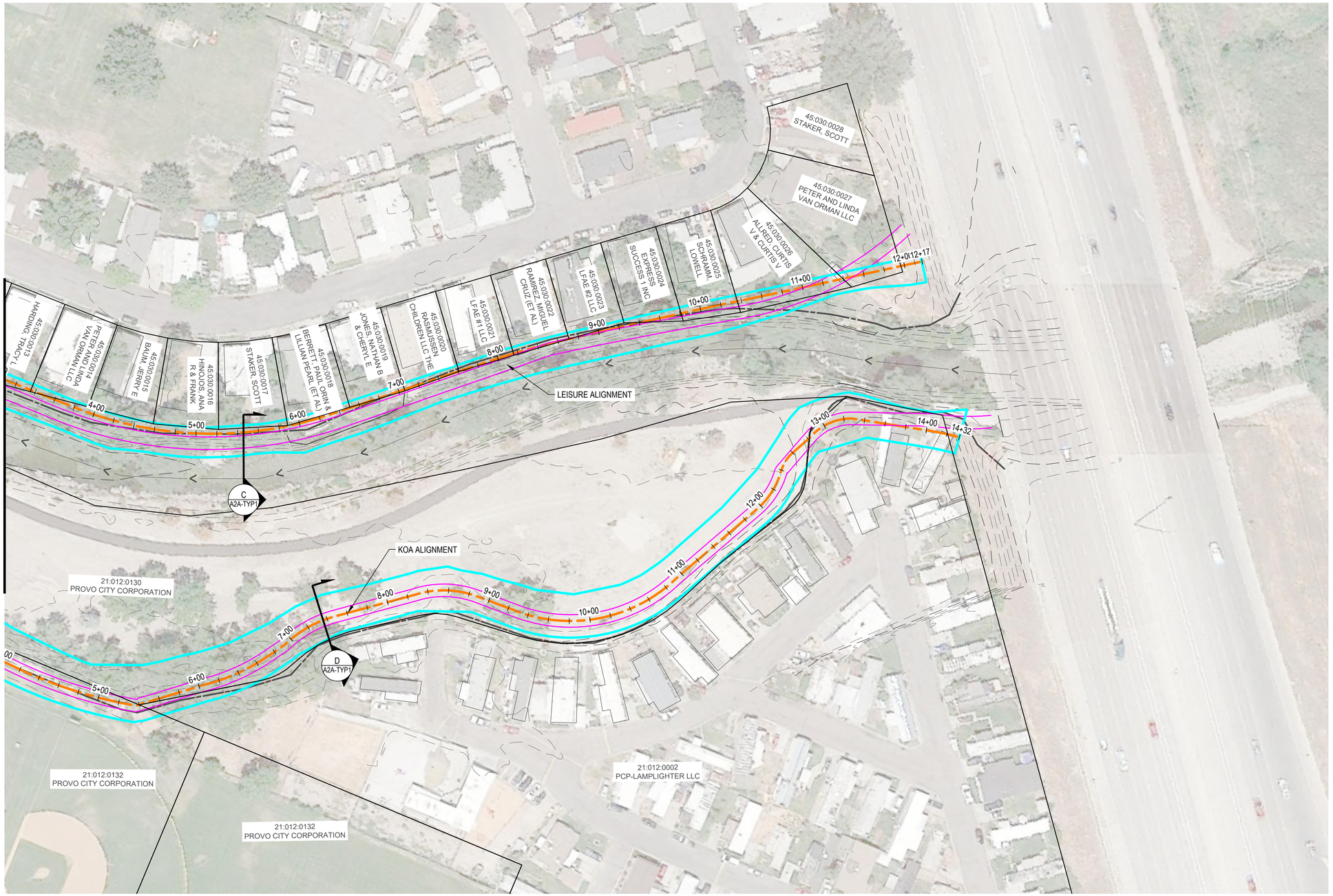
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ALT 2A RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER: 2019-0033
SHEET: 14 OF: 23
SHEET NUMBER: A2A-CP105



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- EX MAJOR CONTOUR (4200)
- EX MINOR CONTOUR (4202)
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER
DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

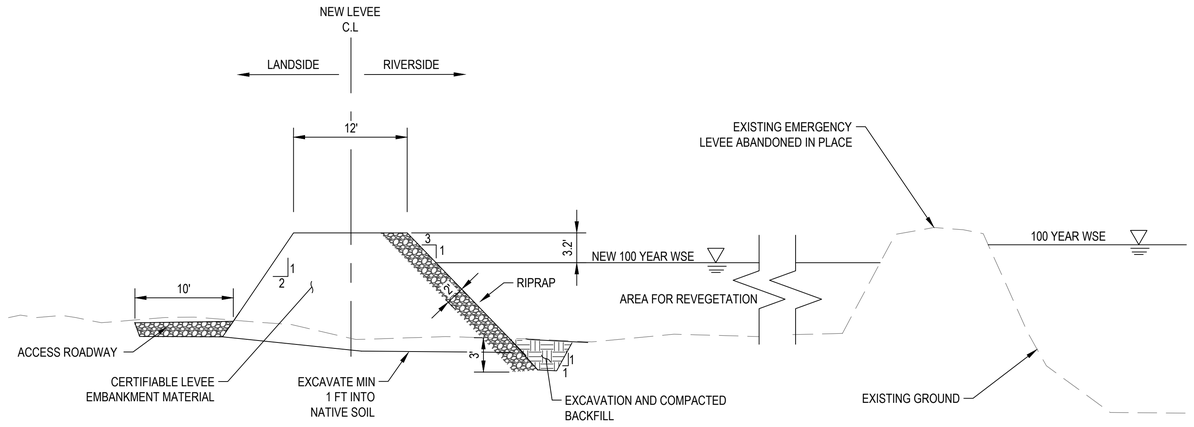
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PROVO CITY
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ALT 2A RIVER PLAN

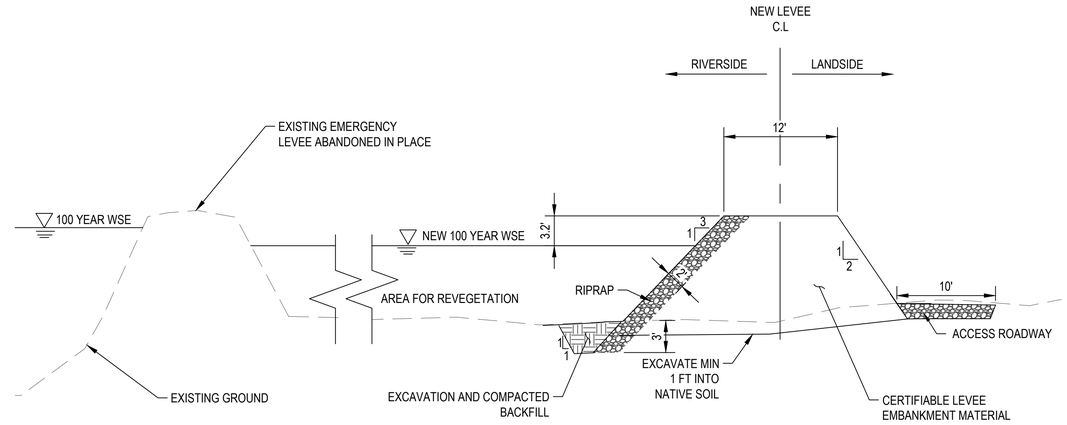
PROVO RIVER & TRAIL — PROVO, UTAH

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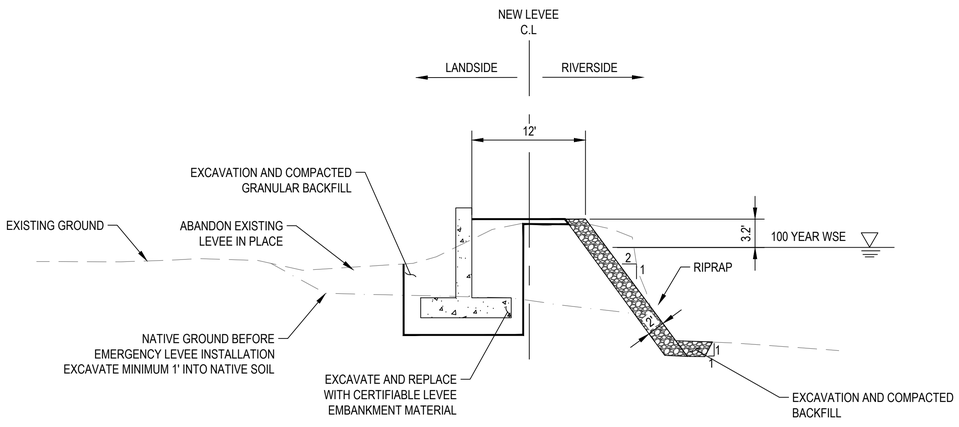
PROJECT NUMBER	2019-0033
SHEET	15
OF	23
SHEET NUMBER	A2A-CP106



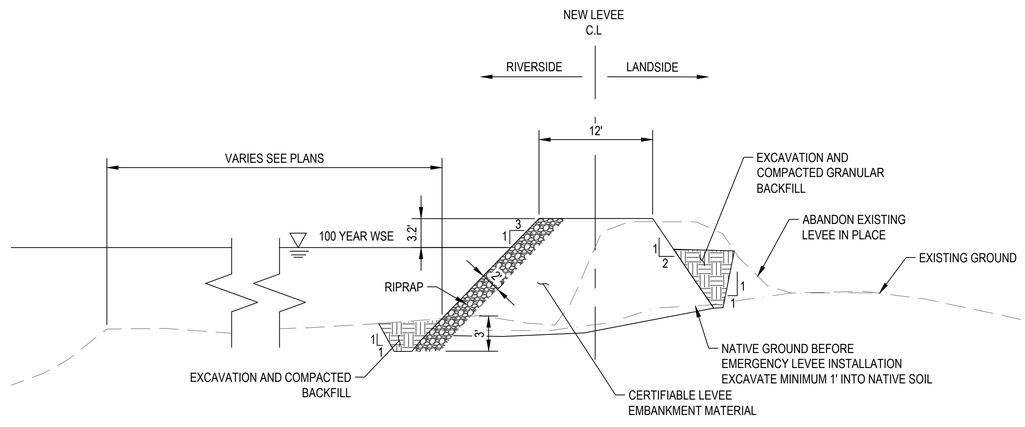
A A2A-TYP1 **R2 LEVEE NORTH**
SCALE: NONE



B A2A-TYP1 **R2 LEVEE SOUTH**
SCALE: NONE



C A2A-TYP1 **LEISURE VILLAGE LEVEE**
SCALE: NONE



D A2A-TYP1 **KOA LEVEE SOUTH**
SCALE: NONE

NOTE:

IN CERTAIN AREAS EXISTING RIVER BANK SLOPES ARE VERY STEEP CAUSING THE IMPLEMENTATION OF THE STABLE 3:1 RIVERSIDE SLOPE TO SIGNIFICANTLY ALTER THE RIVER GEOMETRY. IN THESE AREAS BANK STABILIZATION METHODS TO ACHIEVE STEEPER SLOPES WILL NEED TO BE IMPLEMENTED

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RECORD OF REVISIONS

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PROJECT MANAGER: B. ROOD
CHECKED BY: K. WESTON
DRAWN BY: K. FOSTER
DRAWING SCALE: AS SHOWN
ISSUE DATE: DEC. 2020

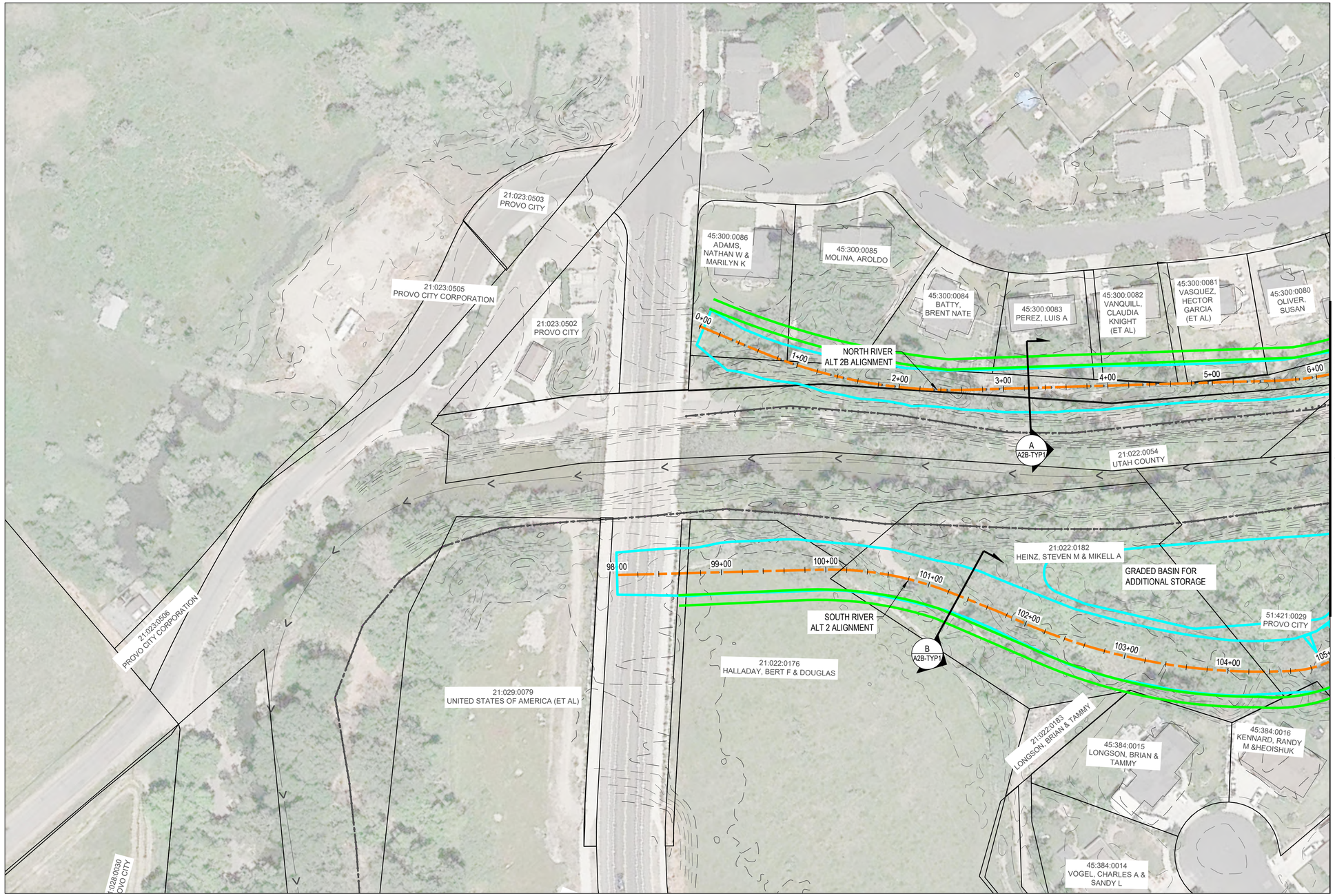
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PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
ALT2A TYPICAL DETAILS

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
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PROJECT NUMBER: 2019-0033
SHEET: 16 OF: 23
SHEET NUMBER: A2A-TYP1



MATCHLINE SEE SHEET A2A-CP102

N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PROJECT MANAGER: B. ROOD
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DRAWN BY: K. FOSTER
DRAWING SCALE: AS SHOWN
ISSUE DATE: DEC. 2020

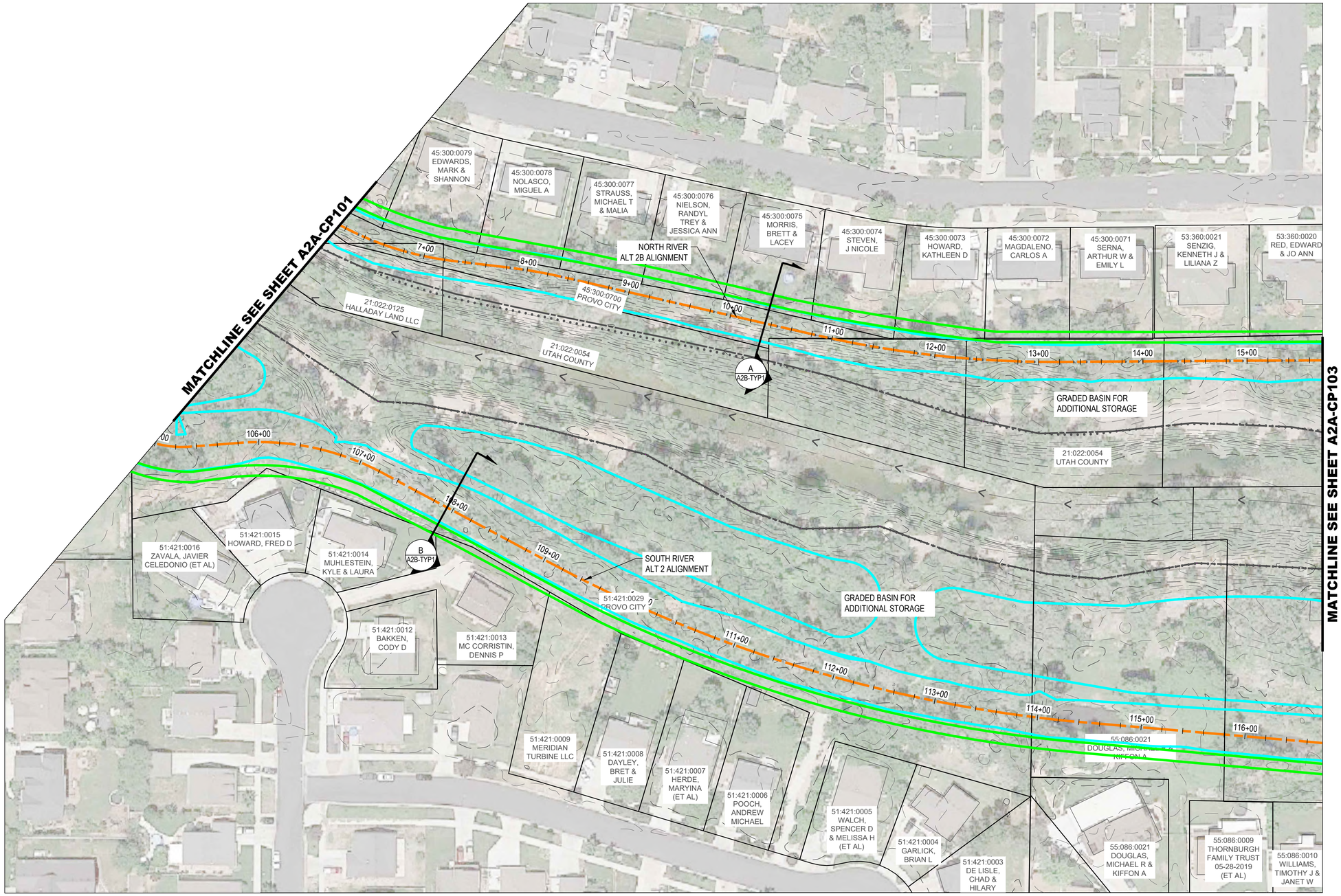
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ALT2B RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER: 2019-0033
SHEET: 17 OF: 23
SHEET NUMBER: A2B-CP101



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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RECORD OF REVISIONS

0 1 2

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PRINCIPAL	M. HIRST, PE
PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER
DRAWING SCALE	AS SHOWN
ISSUE DATE	DEC. 2020

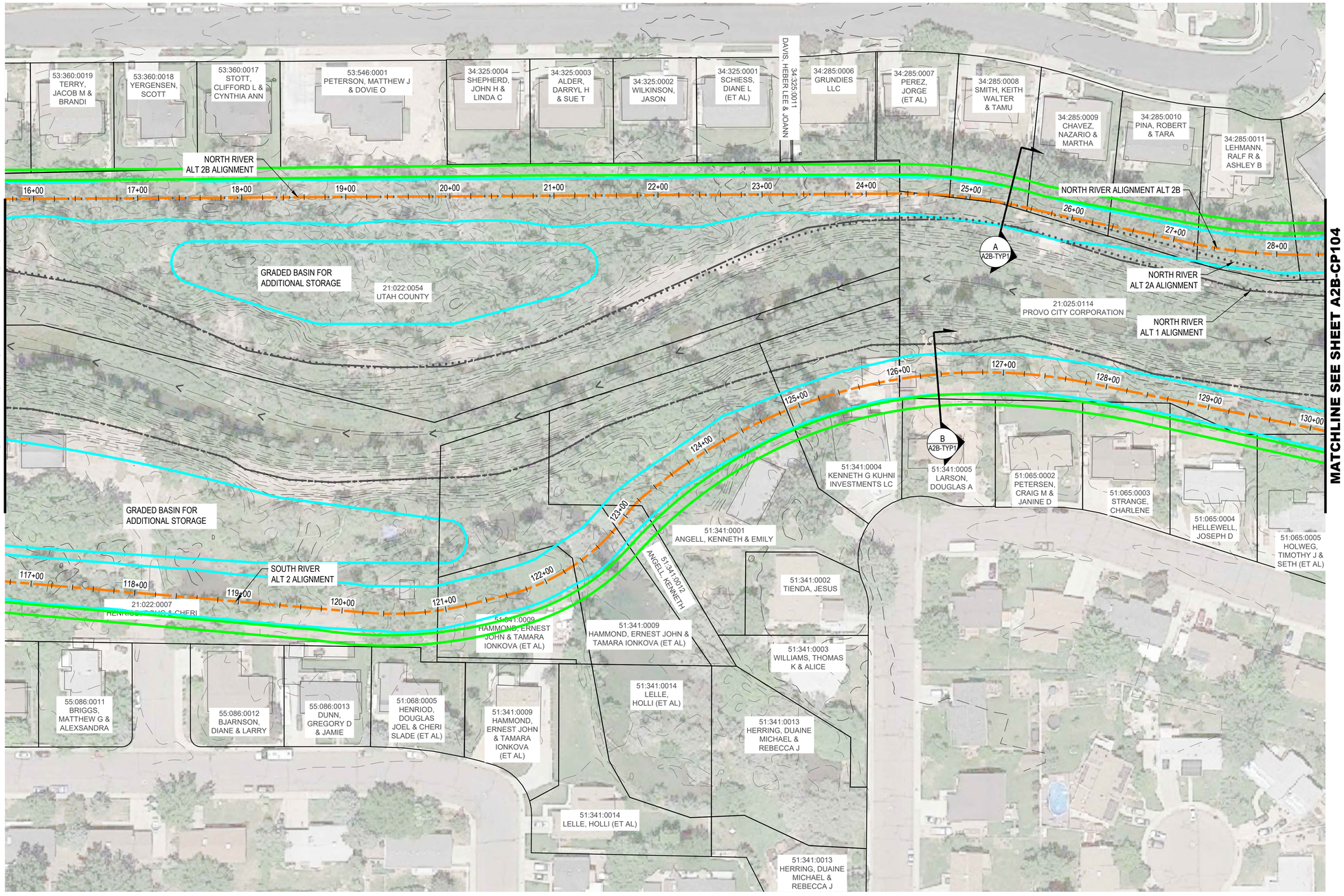
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ALT2B RIVER PLAN

PROVO RIVER & TRAIL
PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER	2019-0033
SHEET	18
OF	23
SHEET NUMBER	A2B-CP102



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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PRINCIPAL	M. HIRST, PE
PROJECT MANAGER	B. ROOD
CHECKED BY	K. WESTON
DRAWN BY	K. FOSTER
DRAWING SCALE	AS SHOWN
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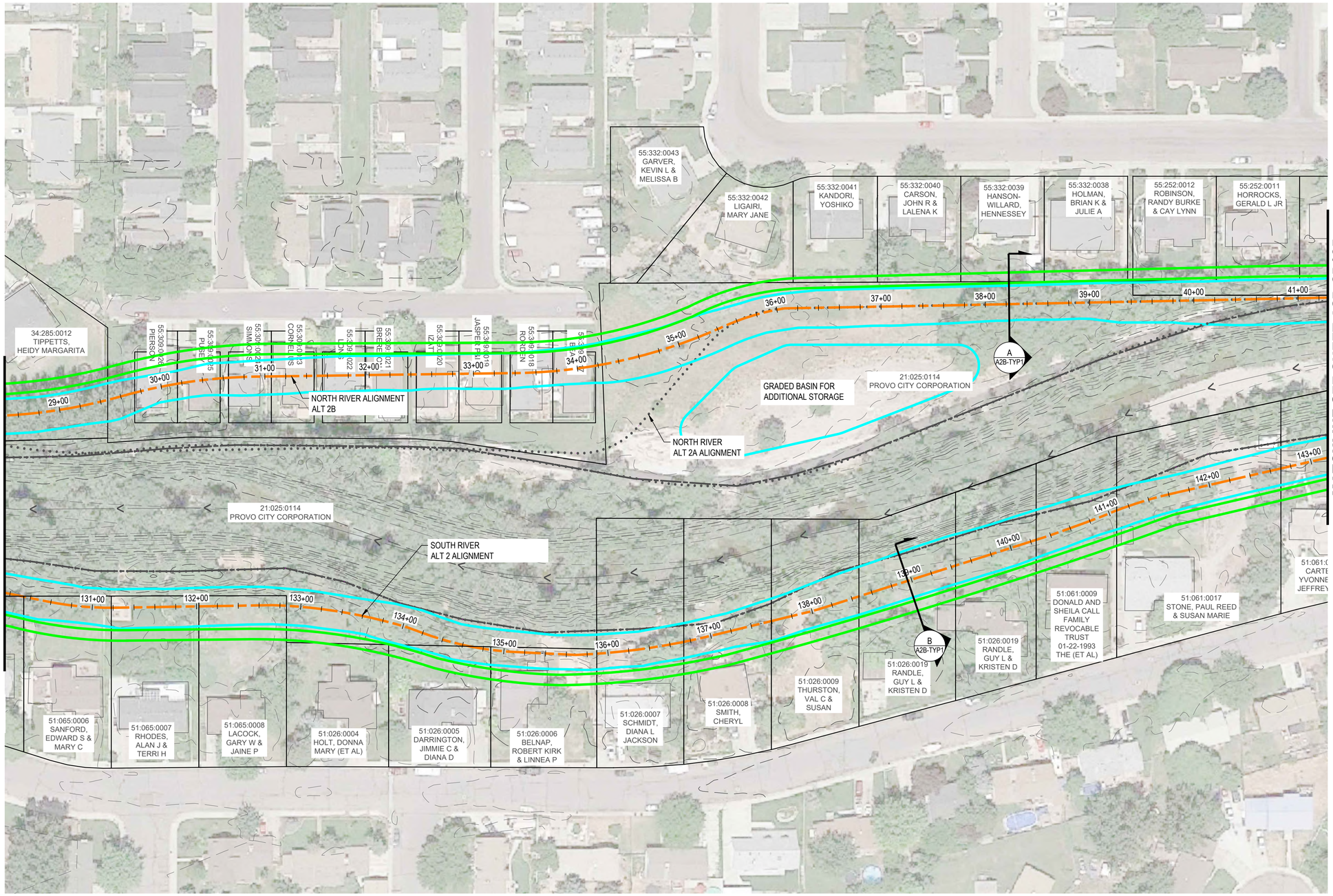
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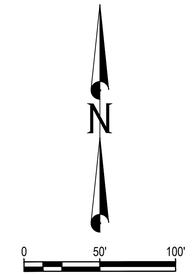
PROVO CITY
PROVO RIVER LEVEE ALTERNATIVES
ALT2B RIVER PLAN

PROVO RIVER & TRAIL — PROVO, UTAH

CONCEPTUAL DESIGN
NOT FOR CONSTRUCTION

PROJECT NUMBER 2019-0033
SHEET 19 OF 23
SHEET NUMBER A2B-CP103





LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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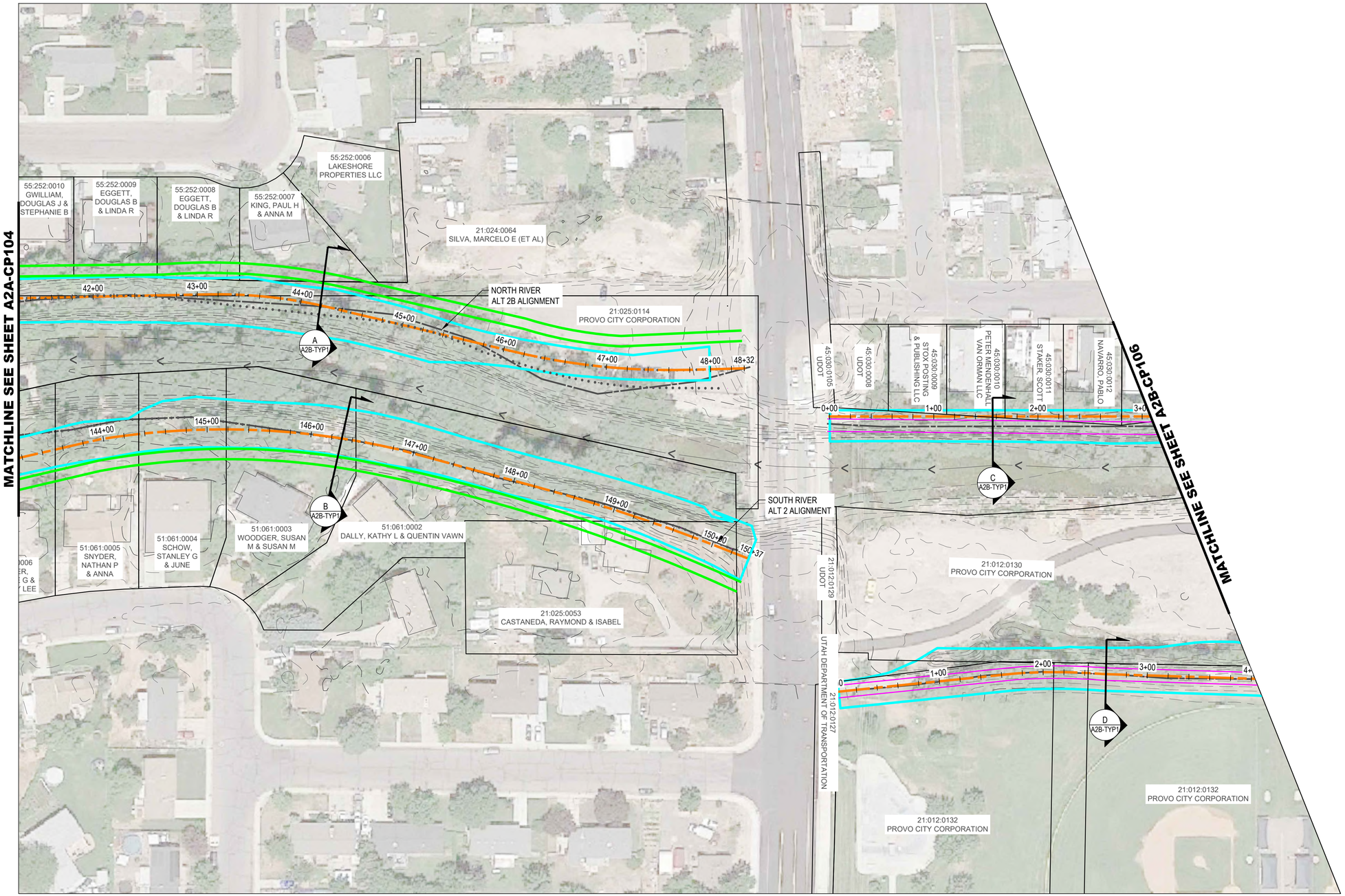
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PROJECT NUMBER: 2019-0033
SHEET: 20 OF: 23
SHEET NUMBER: A2B-CP104



LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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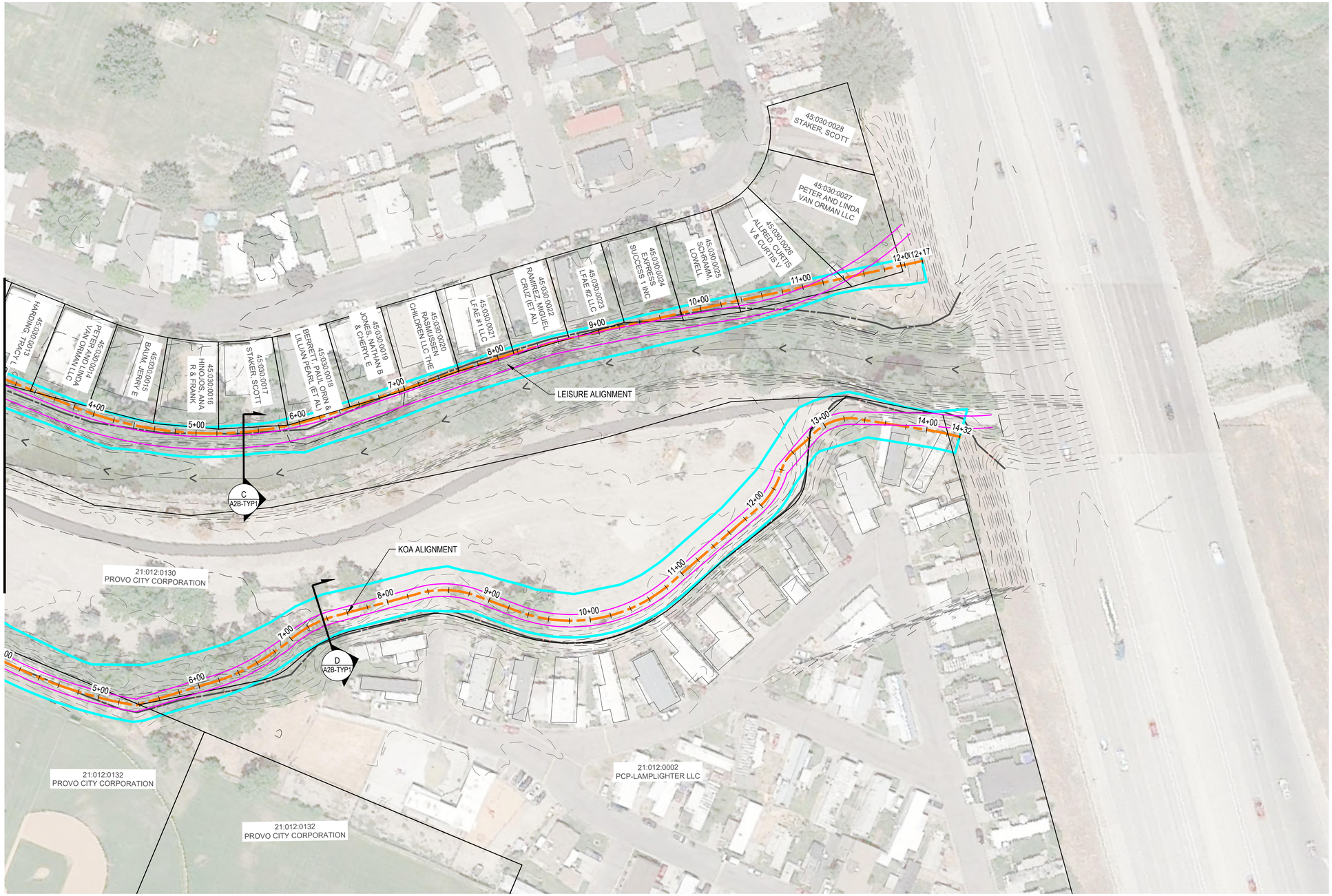
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PROJECT NUMBER	2019-0033
SHEET	21
OF	23
SHEET NUMBER	A2B-CP105

MATCHLINE SEE SHEET A2B-CP105



N

0 50' 100'

LEGEND

- EX LEVEE CENTERLINE
- EX PROPERTY LINE
- EX RIVER CENTERLINE
- EX BUILDING OUTLINE
- 4200 EX MAJOR CONTOUR
- 4202 EX MINOR CONTOUR
- PROPOSED LEVEE/BASIN EXTENT
- PROPOSED TURNOUT EXTENT
- PROPOSED LEVEE ALIGNMENT
- PROPOSED LEVEE TOP
- PROPOSED TURNOUT TOP
- ALTERNATIVE ALIGNMENT
- ACCESS ROADWAY

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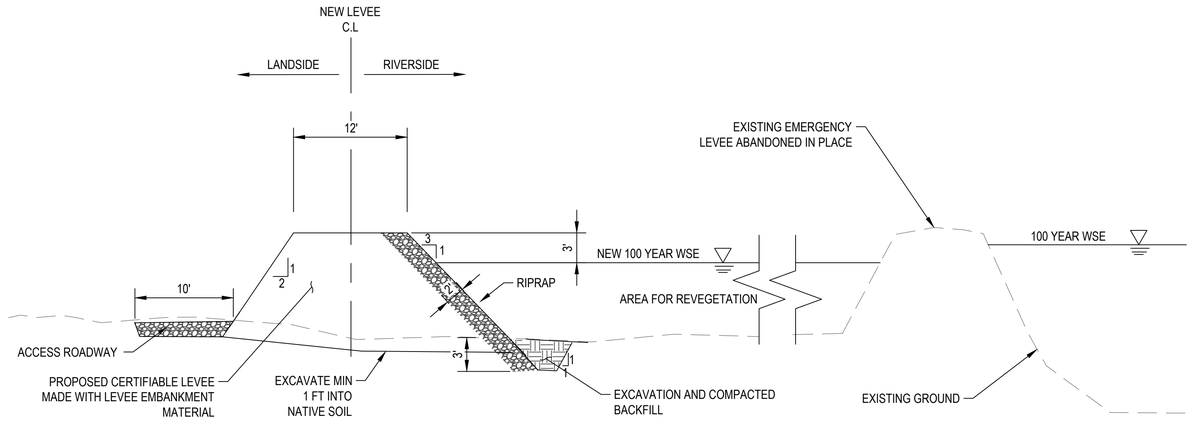
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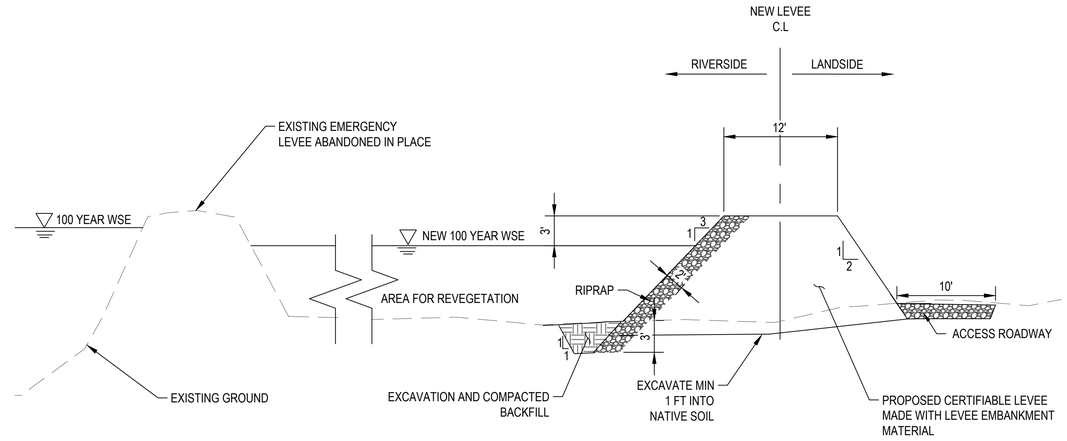
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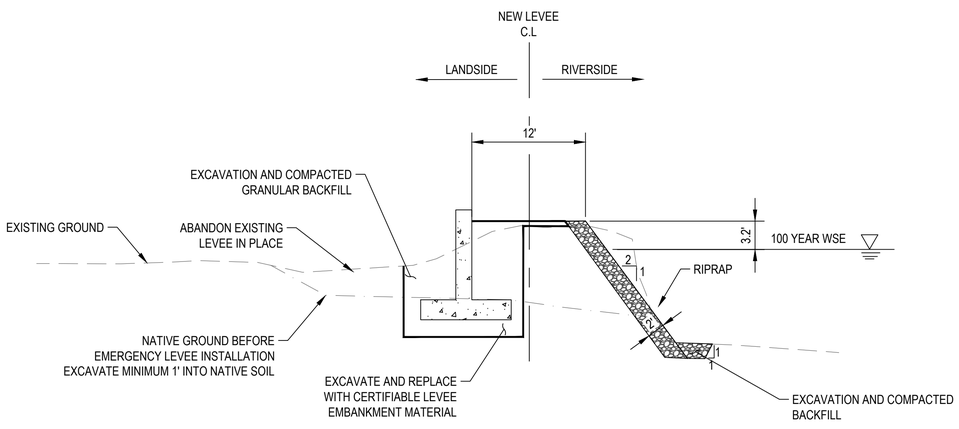
PROJECT NUMBER	2019-0033
SHEET	22
OF	23
SHEET NUMBER	A2B-CP106



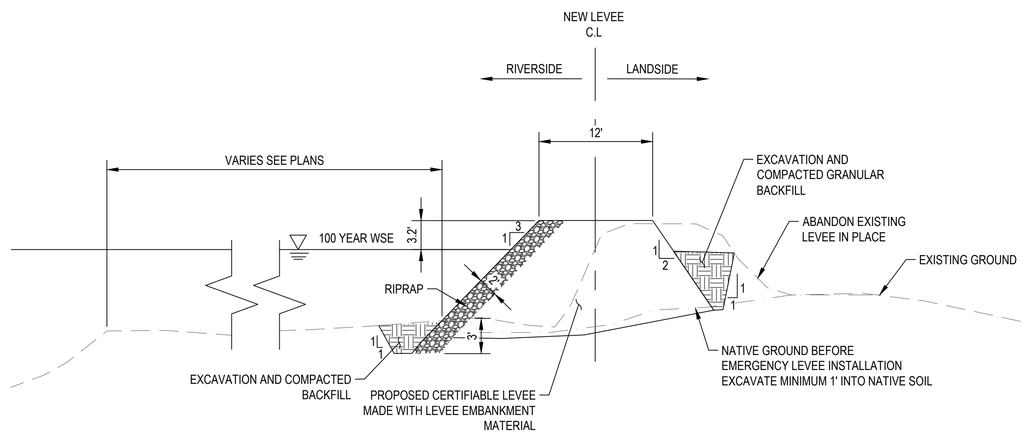
A A2B-TYP1 **R2 LEVEE NORTH**
SCALE: NONE



B A2B-TYP1 **R2 LEVEE SOUTH**
SCALE: NONE



C A2B-TYP1 **LEISURE VILLAGE LEVEE**
SCALE: NONE



D A2B-TYP1 **KOA LEVEE SOUTH**
SCALE: NONE

NOTE:

IN CERTAIN AREAS EXISTING RIVER BANK SLOPES ARE VERY STEEP CAUSING THE IMPLEMENTATION OF THE STABLE 3:1 RIVERSIDE SLOPE TO SIGNIFICANTLY ALTER THE RIVER GEOMETRY. IN THESE AREAS BANK STABILIZATION METHODS TO ACHIEVE STEEPER SLOPES WILL NEED TO BE IMPLEMENTED

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PROVO RIVER & TRAIL — PROVO, UTAH

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PROJECT NUMBER	2019-0033
SHEET	23
OF	23
SHEET NUMBER	A2B-TYP1

APPENDIX D

Benefit-Cost Analysis

Benefit-Cost Analysis: Methodology and Assumptions

This economic analysis of flood damage was performed to be generally consistent with methods identified in USACE guidance for conducting civil works planning studies, as defined in Engineer Regulation [ER] 1105-2-100, with particular focus on Appendix D, Economic and Social Considerations, Amendment 1 (USACE 2000), which serves as the primary source of USACE evaluation methods for use in flood damage reduction studies. ER-1105-2-100 includes the following steps for evaluating "without project" flood damage:

1. Delineate the study area.
2. Determine existing floodplain characteristics (including a floodplain inventory) based on existing levee conditions.
3. Estimate flood damage based on existing levee conditions.

Parcel data land and structure values were received from Provo City's Parcel GIS database. Land only parcels were not included at this stage of the Flood Damage Assessment but will need to be included in the final version prior to FEMA submittal for review. Table D-1 shows a summary of the benefit-cost analysis results. Table D-2 shows a range of initial estimate flood damage costs using FEMA's Multi-hazard Loss Estimation Methodology based on 1%-annual-chance flood depth in feet at each parcel structure above existing ground. Each residential structure within the 1%-annual-chance floodplain limits placed in one of the following three categories to perform the flood damage analysis.

1. 1 Floor, No Basement (1 FL, No Base).
2. Split Floor, No Basement (2 FL, SL, No Base).
3. 2 Floor, No Basement (2 FL, No Base).

Other assumptions in this initial flood damage analysis are the following:

1. Depth-Damage Curve is based on maximum flood depth for each parcel.
2. This flood damage analysis was performed for residential, airport, church, and the elementary school only. A more extensive depth-damage analysis would need to be performed to include all other damage/loss per the requirements set forth in the FEMA Multi-hazard Loss Estimation Methodology Technical Manual prior to submittal to FEMA for review and approval. This includes but is not limited to bus systems, railway systems, utilities, parking, vehicles, economic and social loss, and agricultural.
3. Apartments, commercial, high-density, exempt, DG, DW, BL2S, 2S, 2.5S, & 3S structure classifications from Provo City's GIS Parcel Database were analyzed as 2 Floor, No Basement (2 FL, No Base).
4. Land-only parcels assumed zero damage at this stage in the analysis.
5. Exempt no market value assumed to be $150,000.
6. Blank, SL and 1.5S structure classifications from Provo City's GIS Parcel Database were analyzed as Split Floor, No Basement (2 FL, SL, No Base).
7. 1S and BL1S structure classifications from Provo City's GIS Parcel Database were analyzed as 1 Floor, No Basement (1 FL, No Base).
8. 2 Floor, No Basement curve from Figure 5.2 FIA Credibility – Weighted Building Depth-Damage Curves from FEMA's Multi-hazard Loss Estimation Methodology Technical Manual was used to determine depth-damage percent for the elementary school, churches, and airport as applicable.
9. Damage estimates for churches were determined by (square feet of structure x % damage x $140/square foot).
10. Damage for school was determined by (square feet of structure x % Damage x $120/square foot).

11. Damage for the new airport terminal was determined by Figure 5.2 FIA Credibility – Weighted Building Depth-Damage Curve 1 FL, No Base and Provo City Total Project Cost of $24,000,000 for the new airport terminal.
12. Damage for all existing airport hangars was determined by Depth-Damage Curve 1 FL, No Base and at an average of half½ the size of standard hangars.
13. Damage for airport runways was assumed full replacement.

2 FL, No Base curve was used to approximate Depth-Damage percent for airport office buildings and office building cost was assumed to be $1,500,000 on average.

All costs presented are based on 2020 dollars and are subject to change.

Table D-1: Benefit-Cost Analysis Summary Table

Benefit/Cost Summary Table				
Line Number	**Description** DRAFT	**Estimated Project Cost**	**Estimated Total Flood Damage Assessment Costs**	**Net Construction vs Flood Damage Costs; Benefit/Cost Ratio**
	Alternative 1			**$34,533,206**
1	Consists of complete removal of existing, non-certifiable levees and installation of new levees in the same location (totals for Lakeside, KOA, Leisure, Alt 1 North, Alt 1 South). Existing trail and vegetation will be removed as part of construction. The trail will be rebuilt on the north levee.	$ 74,520,832		**1.46**
2	Flood Damage Assessment - Consists of approximate flood damage costs as it pertains to residential properties, commercial properties, one church, one elementary School, existing airport, and new airport terminal.		$ 109,054,038	
	Alternative 2A			**$57,625,331**
1	Consists of new levees along north and south side of river outside of existing levees. Existing levees to remain with modifications (totals for Lakeside, KOA, Leisure, Alt 2 South, Alt 2A North). Existing trail and vegetation will largely remain in place.	$ 51,428,707		**2.12**
2	Flood Damage Assessment - Consists of approximate flood damage costs as it pertains to residential properties, commercial properties, one church, one elementary school, existing airport, and new airport terminal.		$ 109,054,038	
	Alternative 2B			**$54,549,278**
1	Consists of new levees along north and south side of river outside of existing levees. Existing levees to remain with modifications (totals for Lakeside, KOA, Leisure, Alt 2 South, Alt 2B North). Existing trail and vegetation to largely remain in place.	$ 54,504,760		**2.00**
2	Flood Damage Assessment - Consists of approximate flood damage costs as it pertains to residential properties, commercial properties, one church, one elementary school, existing airport, and new airport terminal.		$ 109,054,038	

Table D-2: Flood Damage Assessment Costs

Provo Levee - Flood Damage Assessment Costs						
Line Item	Description	Unit	Quantity	Unit Cost	Cost	Category Cost
	Residential - 1 Floor, No Basement					**$20,210,607**
1	1 Foot Flood Depth, Damage (191 Properties)	LS	1	$6,085,152	$6,085,152	
2	2 Foot Flood Depth, Damage (70 Properties)	LS	1	$3,432,750	$3,432,750	
3	3 Foot Flood Depth, Damage (16 Properties)	LS	1	$867,244	$867,244	
4	4 Foot Flood Depth, Damage (8 Properties)	LS	1	$505,740	$505,740	
5	5 Foot Flood Depth, Damage (3 Properties)	LS	1	$206,181	$206,181	
6	6 Foot Flood Depth, Damage (1 Properties)	LS	1	$86,040	$86,040	
7	Estimated Average Annual NFIP Flood Insurance Cost per Property (1 Foot Flood Depth)($600/year/property) x 50yrs	EA	191	$30,000	$5,730,000	
8	Estimated Average Annual NFIP Flood Insurance Cost per Property (2 Foot Flood Depth)($650/year/property) x 50yrs	EA	70	$32,500	$2,275,000	
9	Estimated Average Annual NFIP Flood Insurance Cost per Property (3 Foot Flood Depth)($700/year/property) x 50yrs	EA	16	$35,000	$560,000	
10	Estimated Average Annual NFIP Flood Insurance Cost per Property (4 Foot Flood Depth)($750/year/property) x 50yrs	EA	8	$37,500	$300,000	
11	Estimated Average Annual NFIP Flood Insurance Cost per Property (5 Foot Flood Depth)($800/year/property) x 50yrs	EA	3	$40,000	$120,000	
12	Estimated Average Annual NFIP Flood Insurance Cost per Property (6 Foot Flood Depth)($850/year/property) x 50yrs	EA	1	$42,500	$42,500	
	Residential - 2 Floor, Split Level, No Basement					**$8,012,492**
1	1 Foot Flood Depth, Damage (84 Properties)	LS	1	$1,754,230	$1,754,230	
2	2 Foot Flood Depth, Damage (35 Properties)	LS	1	$861,012	$861,012	
3	3 Foot Flood Depth, Damage (9 Properties)	LS	1	$459,175	$459,175	
4	4 Foot Flood Depth, Damage (8 Properties)	LS	1	$421,497	$421,497	
5	5 Foot Flood Depth, Damage (1 Properties)	LS	1	$66,444	$66,444	
6	9 Foot Flood Depth, Damage (1 Properties)	LS	1	$87,634	$87,634	
7	Estimated Average Annual NFIP Flood Insurance Cost per Property (1 Foot Flood Depth)($600/year/property) x 50yrs	EA	84	$30,000	$2,520,000	
8	Estimated Average Annual NFIP Flood Insurance Cost per Property (2 Foot Flood Depth)($650/year/property) x 50yrs	EA	35	$32,500	$1,137,500	
9	Estimated Average Annual NFIP Flood Insurance Cost per Property (3 Foot Flood Depth)($700/year/property) x 50yrs	EA	9	$35,000	$315,000	
10	Estimated Average Annual NFIP Flood Insurance Cost per Property (4 Foot Flood Depth)($750/year/property) x 50yrs	EA	8	$37,500	$300,000	
11	Estimated Average Annual NFIP Flood Insurance Cost per Property (5 Foot Flood Depth)($800/year/property) x 50yrs	EA	1	$40,000	$40,000	
12	Estimated Average Annual NFIP Flood Insurance Cost per Property (9 Foot Flood Depth)($1000/year/property) x 50yrs	EA	1	$50,000	$50,000	
	Residential - 2 Floor, No Basement					**$16,144,065**
1	1 Foot Flood Depth, Damage (197 Properties)	LS	1	$4,311,443	$4,311,443	
2	2 Foot Flood Depth, Damage (40 Properties)	LS	1	$783,224	$783,224	
3	3 Foot Flood Depth, Damage (10 Properties)	LS	1	$285,000	$285,000	
4	4 Foot Flood Depth, Damage (10 Properties)	LS	1	$300,000	$300,000	
5	5 Foot Flood Depth, Damage (10 Properties)	LS	1	$376,398	$376,398	
6	6 Foot Flood Depth, Damage (7 Properties)	LS	1	$252,000	$252,000	
7	7 Foot Flood Depth, Damage (4 Properties)	LS	1	$156,000	$156,000	
8	8 Foot Flood Depth, Damage (1 Properties)	LS	1	$45,000	$45,000	
9	9 Foot Flood Depth, Damage (2 Properties)	LS	1	$99,000	$99,000	
10	10 Foot Flood Depth, Damage (2 Properties)	LS	1	$114,000	$114,000	
11	12 Foot Flood Depth, Damage (3 Properties)	LS	1	$184,500	$184,500	
12	Estimated Average Annual NFIP Flood Insurance Cost per Property (1 Foot Flood Depth)($600/year/property) x 50yrs	EA	197	$30,000	$5,910,000	
13	Estimated Average Annual NFIP Flood Insurance Cost per Property (2 Foot Flood Depth)($650/year/property) x 50yrs	EA	40	$32,500	$1,300,000	
14	Estimated Average Annual NFIP Flood Insurance Cost per Property (3 Foot Flood Depth)($700/year/property) x 50yrs	EA	10	$35,000	$350,000	
15	Estimated Average Annual NFIP Flood Insurance Cost per Property (4 Foot Flood Depth)($750/year/property) x 50yrs	EA	10	$37,500	$375,000	
16	Estimated Average Annual NFIP Flood Insurance Cost per Property (5 Foot Flood Depth)($800/year/property) x 50yrs	EA	10	$40,000	$400,000	
17	Estimated Average Annual NFIP Flood Insurance Cost per Property (6 Foot Flood Depth)($850/year/property) x 50yrs	EA	7	$42,500	$297,500	
18	Estimated Average Annual NFIP Flood Insurance Cost per Property (7 Foot Flood Depth)($900/year/property) x 50yrs	EA	4	$45,000	$180,000	
19	Estimated Average Annual NFIP Flood Insurance Cost per Property (8 Foot Flood Depth)($950/year/property) x 50yrs	EA	1	$47,500	$47,500	
20	Estimated Average Annual NFIP Flood Insurance Cost per Property (9 Foot Flood Depth)($1000/year/property) x 50yrs	EA	2	$50,000	$100,000	
21	Estimated Average Annual NFIP Flood Insurance Cost per Property (10 Foot Flood Depth)($1050/year/property) x 50yrs	EA	2	$52,500	$105,000	
22	Estimated Average Annual NFIP Flood Insurance Cost per Property (12 Foot Flood Depth)($1150/year/property) x 50yrs	EA	3	$57,500	$172,500	
	Churches					**$423,024**
1	Church 1 & 2	LS	1	$423,024	$423,024	
	Elementary School					**$1,521,850**
1	Elementary School	LS	1	$1,521,850	$1,521,850	
	Airport - New Terminal not included					**$52,662,000**
1	ACTS - Airport Control Tower	LS	1	$2,150,000	$2,150,000	
2	APTR - Airport Runway	LS	1	$28,000,000	$28,000,000	
3	AMFS - Airport Maintenance & Hangar	EA	24	$688,000	$16,512,000	
4	Airport Office Buildings	EA	10	$600,000	$6,000,000	
	Airport - New Terminal only					**$10,080,000**
1	Airport Terminal	LS	1	$10,080,000	$10,080,000	
					Total Flood Damage Assessment Costs	**$109,054,038**

Table D-3: Construction Cost Estimate – Alternative 1

Line Number	Description	Quantity	Unit	Unit Cost	Total Cost	Category Cost
1	**Contruction and Materials**					**$22,559,056**
2	Property acquisition (full acquisition)	2	Lot	$ 125,000	$ 250,000	
3	Property acquistion (partial acquisition)	5.60	Acre	$ 522,720	$ 2,926,770	
4	Mobilization	1	LS	$ 2,156,359	$ 2,156,359	
5	Erosion control (SWPPP)	1	LS	$ 250,000	$ 250,000	
6	Clearing and grubbing	54	Acre	$ 6,000	$ 321,324	
7	Leisure Village levee flood wall	1,215	LF	$ 430	$ 522,450	
8	Earthwork: River levee export (to moat)	91,858	CY	$ 10.00	$ 918,584	
9	Earthwork: River levee import	76,186	CY	$ 25.00	$ 1,904,639	
10	Earthwork: Lakeside levee export (to moat)	204,402	CY	$ 10.00	$ 2,044,018	
11	Earthwork: Lakeside levee import	44,713	CY	$ 25.00	$ 1,117,835	
12	Earthwork processing (Lakeside levee)	204,402	CY	$ 15.00	$ 3,066,027	
13	Earthwork: Center Street Levee export (to moat)	34,949	CY	$ 10.00	$ 349,490	
14	Earthwork: Center Street levee import	51,131	CY	$ 25.00	$ 1,278,287	
15	Earthwork: total project export (-)/import (+)	-28,209	CY	$ 10.00	$ 282,092	
16	Riprap: River levee import	23,180	CY	$ 30	$ 695,412	
17	Riprap: Lakeside levee processing	36,962	CY	$ 15	$ 554,432	
18	Remove asphalt	36,689	SY	$ 6.75	$ 247,650	
19	Roadbase	15,639	CY	$ 36.00	$ 562,987	
20	Pavement	4,577	Ton	$ 80.00	$ 366,199	
21	Closures (of miscellaneous pipelines)	10	EA	$ 20,000	$ 200,000	
22	Pump station relocation/improvement	3	LS	$ 400,000	$ 1,200,000	
23	Pipe installation (moat; 60" diameter)	13,250	LF	$ 60	$ 795,000	
24	Relocate Existing Waterline (Center Street Levee)	3,140	LF	$ 175	$ 549,500	
25	**Channel Restoration**					**$22,150,000**
26	Channel reconstruction and finish work (I-15 to Geneva Road)	0.205	Mile	$1,000,000	$ 205,000	
27	Channel reconstruction and finish work (Geneva Road to Lakeshore Drive)	0.945	Mile	$1,000,000	$ 945,000	
28	Channel reconstruction and finish work (north and south side channels)	0	Mile	$300,000	$ -	
29	Connecting main channel with north and south channels	0	EA	$20,000	$ -	
30	Public access enhancements	0	LS	$20,000	$ -	
31	Off-site June sucker habitat mitigation	1	LS	$20,000,000	$ 20,000,000	
32	Yellow-billed cuckoo (YBC) habitat mitigation	1	LS	$1,000,000	$ 1,000,000	
33	**Environmental**					**$12,430,000**
34	Wetland delineation for approved jurisdictional determination (Lake levee/moat)	1	LS	$35,000	$ 35,000	
35	Environmental impact/wetland mitigation (with vegetation); Lake levee/moat	10	Acre	$50,000	$ 500,000	
36	Environmental impcact/wetland mitigation (non-vegetated); Lake levee/moat	40	Acre	$25,000	$ 1,000,000	
37	Environmental impact/wetland mitigation-temporary (1:1); River levee	4	Acre	$50,000	$ 200,000	
38	Environmental impact/wetland mitigation-permanent (4:1); River levee	16	Acre	$50,000	$ 800,000	
39	Property costs for environmental impact/wetland mitigation	70	Acre	$100,000	$ 7,000,000	
40	Stream alteration permit	1	LS	$20,000	$ 20,000	
41	404 permit	1	LS	$100,000	$ 100,000	
42	Class III cultural resource inventory	1	LS	$40,000	$ 40,000	
43	Cultural resource monitoring, programmatic agreement, testing, and mitigation	1	LS	$675,000	$ 675,000	
44	Threatened and Endangered surveys	1	LS	$20,000	$ 20,000	
45	YBC monitoring	1	LS	$40,000	$ 40,000	
46	National Environmental Protection Act/Biological Assessment (NEPA/BA)	1	LS	$2,000,000	$ 2,000,000	
47	**Vegetation Management**					**$1,262,850**
48	Pre-construction noxious weed treatment	1	LS	$7,000	$ 7,000	
49	Post-construction noxious weed control	1	LS	$11,600	$ 11,600	
50	Upland grass/wildflower seed and mulch (levee plus 15' buffer)	63	Acre	$6,500	$ 409,500	
51	Riparian grass/wildflower/shrub seed and mulch (restored areas)	3	Acre	$8,000	$ 24,000	
52	Wetland seed and mulch (near Lake levee)	9	Acre	$9,500	$ 85,500	
53	Plantings	3	Acre	$5,500	$ 16,500	
54	Topsoil import and placement	75	Acre	$5,450	$ 408,750	
55	Temporary irrigation	75	Acre	$4,000	$ 300,000	
56					Total	$58,401,906
57					10% Construction contingency	$ 5,840,191
58					Construction total	$ 64,242,097
59					15% Engineering (planning, design, construction)	$ 9,636,315
60					1% Administrative (legal, funding)	$ 642,421
61					**Grand Total**	**$ 74,520,832**
62					Class 5 estimate (high +30% to +100%; used +65%)	$ 122,959,373
63					Class 5 estimate (low -20% to -50%; used -35%)	$ 48,438,541

Table D-4: Construction Cost Estimate – Alternative 2A

Line Number	Description	Quantity	Unit	Unit Cost	Total Cost	Category Cost
1	**Contruction and Materials**					**$25,183,829**
2	Property acquisition (full acquisition)	9	Lot	$ 366,760	$ 3,300,839	
3	Property acquistion (partial acquisition)	7.62	Acre	$ 522,720	$ 3,981,247	
4	Mobilization	1	LS	$ 1,137,426	$ 1,137,426	
5	Erosion control (SWPPP)	1	LS	$ 250,000	$ 250,000	
6	Clearing and grubbing	54	Acre	$ 6,000	$ 321,835	
7	Leisure Village levee flood wall	1,215	LF	$ 430	$ 522,450	
8	Earthwork: River levee export (to moat)	65,379	CY	$ 10.00	$ 653,793	
9	Earthwork: River levee import	89,717	CY	$ 25.00	$ 2,242,937	
10	Earthwork: Lakeside levee export (to moat)	204,402	CY	$ 10.00	$ 2,044,018	
11	Earthwork: Lakeside levee import	44,713	CY	$ 25.00	$ 1,117,835	
12	Earthwork processing (Lakeside levee)	204,402	CY	$ 15.00	$ 3,066,027	
13	Earthwork: Center Street Levee export (to moat)	34,949	CY	$ 10.00	$ 349,490	
14	Earthwork: Center Street levee import	51,131	CY	$ 25.00	$ 1,278,287	
15	Earthwork: total project export (-)/import (+)	-1,730	CY	$ 10.00	$ 17,302	
16	Riprap: River levee import	19,479	CY	$ 30	$ 584,370	
17	Riprap: Lakeside levee processing	36,962	CY	$ 15	$ 554,432	
18	Remove asphalt	34,612	SY	$ 6.75	$ 233,633	
19	Roadbase	14,424	CY	$ 36.00	$ 519,253	
20	Pavement	3,302	Ton	$ 80.00	$ 264,154	
21	Closures (of miscellaneous pipelines)	10	EA	$ 20,000	$ 200,000	
22	Pump station relocation/improvement	3	LS	$ 400,000	$ 1,200,000	
23	Pipe installation (moat; 60" diameter)	13,250	LF	$ 60	$ 795,000	
24	Relocate Existing Waterline (Center Street Levee)	3,140	LF	$ 175	$ 549,500	
25	**Channel Restoration**					**$2,038,600**
26	Channel reconstruction and finish work (I-15 to Geneva Road)	0.205	Mile	$1,000,000	$ 205,000	
27	Channel reconstruction and finish work (Geneva Road to Lakeshore Drive)	0.945	Mile	$1,000,000	$ 945,000	
28	Channel reconstruction and finish work (north and south side channels)	0.562	Mile	$300,000	$ 168,600	
29	Connecting main channel with north and south channels	10	EA	$20,000	$ 200,000	
30	Public access enhancements	1	LS	$20,000	$ 20,000	
31	Off-site June sucker habitat mitigation	0	LS	$20,000,000	$ -	
32	Yellow-billed cuckoo (YBC) habitat mitigation	1	LS	$500,000	$ 500,000	
33	**Environmental**					**$11,625,000**
34	Wetland delineation for approved jurisdictional determination (Lake levee/moat)	1	LS	$35,000	$ 35,000	
35	Environmental impact/wetland mitigation (with vegetation); Lake levee/moat	10	Acre	$50,000	$ 500,000	
36	Environmental impcact/wetland mitigation (non-vegetated); Lake levee/moat	40	Acre	$25,000	$ 1,000,000	
37	Environmental impact/wetland mitigation-temporary (1:1); River levee	4	Acre	$50,000	$ 200,000	
38	Environmental impact/wetland mitigation-permanent (4:1); River levee	16	Acre	$50,000	$ 800,000	
39	Property costs for environmental impact/wetland mitigation	70	Acre	$100,000	$ 7,000,000	
40	Stream alteration permit	1	LS	$15,000	$ 15,000	
41	404 permit	1	LS	$50,000	$ 50,000	
42	Class III cultural resource inventory	1	LS	$40,000	$ 40,000	
43	Cultural resource monitoring, programmatic agreement, testing, and mitigation	1	LS	$675,000	$ 675,000	
44	Threatened and Endangered surveys	1	LS	$20,000	$ 20,000	
45	YBC monitoring	1	LS	$40,000	$ 40,000	
46	National Environmental Protection Act/Biological Assessment (NEPA/BA)	1	LS	$1,250,000	$ 1,250,000	
47	**Vegetation Management**					**$1,457,200**
48	Pre-construction noxious weed treatment	1	LS	$7,000	$ 7,000	
49	Post-construction noxious weed control	1	LS	$11,600	$ 11,600	
50	Upland grass/wildflower seed and mulch (levee plus 15' buffer)	60.5	Acre	$6,500	$ 393,250	
51	Riparian grass/wildflower/shrub seed and mulch (restored areas)	13	Acre	$8,000	$ 104,000	
52	Wetland seed and mulch (near Lake levee)	9	Acre	$9,500	$ 85,500	
53	Plantings	13	Acre	$5,500	$ 71,500	
54	Topsoil import and placement	83	Acre	$5,450	$ 452,350	
55	Temporary irrigation	83	Acre	$4,000	$ 332,000	
56					Total	$40,304,629
57					10% Construction contingency	$ 4,030,463
58					Construction total	$ 44,335,092
59					15% Engineering (planning, design, construction)	$ 6,650,264
60					1% Administrative (legal, funding)	$ 443,351
61					**Grand Total**	**$ 51,428,707**
62					Class 5 estimate (high +30% to +100%; used +65%)	$ 84,857,366
63					Class 5 estimate (low -20% to -50%; used -35%)	$ 33,428,659

Table D-5: Construction Cost Estimate – Alternative 2B

Line Number	Description	Quantity	Unit	Unit Cost	Total Cost	Category Cost
1	**Contruction and Materials**					**$27,780,679**
2	Property acquisition (full acquisition)	19	Lot	$ 313,149	$ 5,949,839	
3	Property acquistion (partial acquisition)	7.75	Acre	$ 522,720	$ 4,050,487	
4	Mobilization	1	LS	$ 1,134,924	$ 1,134,924	
5	Erosion control (SWPPP)	1	LS	$ 250,000	$ 250,000	
6	Clearing and grubbing	53	Acre	$ 6,000	$ 319,912	
7	Leisure Village levee flood wall	1,215	LF	$ 430	$ 522,450	
8	Earthwork: River levee export (to moat)	61,661	CY	$ 10.00	$ 616,612	
9	Earthwork: River levee import	87,121	CY	$ 25.00	$ 2,178,020	
10	Earthwork: Lakeside levee export (to moat)	204,402	CY	$ 10.00	$ 2,044,018	
11	Earthwork: Lakeside levee import	44,713	CY	$ 25.00	$ 1,117,835	
12	Earthwork processing (Lakeside levee)	204,402	CY	$ 15.00	$ 3,066,027	
13	Earthwork: Center Street Levee export (to moat)	34,949	CY	$ 10.00	$ 349,490	
14	Earthwork: Center Street levee import	51,131	CY	$ 25.00	$ 1,278,287	
15	Earthwork: total project export (-)/import (+)	1,988	CY	$ 10.00	$ 19,879	
16	Riprap: River levee import	19,024	CY	$ 30	$ 570,728	
17	Riprap: Lakeside levee processing	36,962	CY	$ 15	$ 554,432	
18	Remove asphalt	34,049	SY	$ 6.75	$ 229,830	
19	Roadbase	14,424	CY	$ 36.00	$ 519,253	
20	Pavement	3,302	Ton	$ 80.00	$ 264,154	
21	Closures (of miscellaneous pipelines)	10	EA	$ 20,000	$ 200,000	
22	Pump station relocation/improvement	3	LS	$ 400,000	$ 1,200,000	
23	Pipe installation (moat; 60" diameter)	13,250	LF	$ 60	$ 795,000	
24	Relocate Existing Waterline (Center Street Levee)	3,140	LF	$ 175	$ 549,500	
25	**Channel Restoration**					**$2,038,600**
26	Channel reconstruction and finish work (I-15 to Geneva Road)	0.205	Mile	$1,000,000	$ 205,000	
27	Channel reconstruction and finish work (Geneva Road to Lakeshore Drive)	0.945	Mile	$1,000,000	$ 945,000	
28	Channel reconstruction and finish work (north and south side channels)	0.562	Mile	$300,000	$ 168,600	
29	Connecting main channel with north and south channels	10	EA	$20,000	$ 200,000	
30	Public access enhancements	1	LS	$20,000	$ 20,000	
31	Off-site June sucker habitat mitigation	0	LS	$20,000,000	$ -	
32	Yellow-billed cuckoo (YBC) habitat mitigation	1	LS	$500,000	$ 500,000	
33	**Environmental**					**$11,370,000**
34	Wetland delineation for approved jurisdictional determination (Lake levee/moat)	1	LS	$35,000	$ 35,000	
35	Environmental impact/wetland mitigation (with vegetation); Lake levee/moat	10	Acre	$50,000	$ 500,000	
36	Environmental impcact/wetland mitigation (non-vegetated); Lake levee/moat	40	Acre	$25,000	$ 1,000,000	
37	Environmental impact/wetland mitigation-temporary (1:1); River levee	4	Acre	$50,000	$ 200,000	
38	Environmental impact/wetland mitigation-permanent (4:1); River levee	16	Acre	$50,000	$ 800,000	
39	Property costs for environmental impact/wetland mitigation	70	Acre	$100,000	$ 7,000,000	
40	Stream alteration permit	1	LS	$20,000	$ 20,000	
41	404 permit	1	LS	$40,000	$ 40,000	
42	Class III cultural resource inventory	1	LS	$40,000	$ 40,000	
43	Cultural resource monitoring, programmatic agreement, testing, and mitigation	1	LS	$675,000	$ 675,000	
44	Threatened and Endangered surveys	1	LS	$20,000	$ 20,000	
45	YBC monitoring	1	LS	$40,000	$ 40,000	
46	National Environmental Protection Act/Biological Assessment (NEPA/BA)	1	LS	$1,000,000	$ 1,000,000	
47	**Vegetation Management**					**$1,526,050**
48	Pre-construction noxious weed treatment	1	LS	$7,000	$ 7,000	
49	Post-construction noxious weed control	1	LS	$11,600	$ 11,600	
50	Upland grass/wildflower seed and mulch (levee plus 15' buffer)	60.5	Acre	$6,500	$ 393,250	
51	Riparian grass/wildflower/shrub seed and mulch (restored areas)	16	Acre	$8,000	$ 128,000	
52	Wetland seed and mulch (near Lake levee)	9	Acre	$9,500	$ 85,500	
53	Plantings	16	Acre	$5,500	$ 88,000	
54	Topsoil import and placement	86	Acre	$5,450	$ 468,700	
55	Temporary irrigation	86	Acre	$4,000	$ 344,000	
56					Total	$42,715,329
57					10% Construction contingency	$ 4,271,533
58					Construction total	$ 46,986,862
59					15% Engineering (planning, design, construction)	$ 7,048,029
60					1% Administrative (legal, funding)	$ 469,869
61					**Grand Total**	**$ 54,504,760**
62					Class 5 estimate (high +30% to +100%; used +65%)	$ 89,932,854
63					Class 5 estimate (low -20% to -50%; used -35%)	$ 35,428,094

APPENDIX E

River Restoration Factors

When embarking on any project to restore the proper functioning of a riverine ecosystem, eight general factors may ultimately determine the long-term success or failure of the project. The role of these factors should always be considered, and the applicability of each factor to a given project should be evaluated and understood. These factors are defined, and their importance for this project explained, in the following list of important factors of river restoration.

Legal Protection

The first important factor to consider for river restoration is legal protection of the resource being improved. Given the extreme pressure to develop many of our natural resources and the likelihood that the utilization of an existing property will change in the future, the need to ensure some sort of legal protection, prior to undertaking an ecosystem restoration project, is important. Unforeseen changes in management or utilization can greatly influence the future condition of a site: for better or for worse. Some form of legal protection, which ensures that the goals of a project are compatible with future uses of a resource, should be a part of any restoration project, and is a part of Alternatives 2A and 2B.

Space

Rivers, in most settings, need space to function naturally. Alluvial rivers migrate back and forth across their floodplains, eroding banks and creating new deposits. When insufficient space is available for natural riverine processes, living rivers can become mere water delivery systems. Encroachment into floodplain areas is a nearly ubiquitous problem along most rivers in the United States. That encroachment comes from many sources, including agriculture, home building, urbanization, and commercial and industrial development, to name only a few. The ability to acquire sufficient space for a functional river system is of great importance for the long-term viability and sustainability of a riverine ecosystem. Alternatives 2A and 2B will provide additional area that is available for riverine processes, as compared to Alternative 1 and the existing condition. Although the full suite of natural processes cannot be accommodated under these alternatives, some natural function is possible, given sufficient space. Regarding this factor, Alternative 2B performs better than Alternative 2A.

"Natural" Hydrology

Most rivers in the western United States have hydrologic regimes that have been altered, to some extent, by human activities. The degree of that alteration varies from minimal to extreme. Changes in hydrology can have a profound influence on the riverine ecosystems that the rivers support because many organisms are physiologically adapted, in one way or another, to the naturally occurring streamflow variability found within a given system. When that streamflow variability changes, beyond the range found under natural conditions, many organisms experience extreme stress or are lost entirely from the ecosystem. In many circumstances, it is not possible to restore the natural hydrologic variability of a river to its pre-disturbance regime. However, it often is possible to work, within the existing constraints found in a system, to provide a hydrology that mimics the natural hydrology closely enough to maintain a properly functioning system. The Provo River is currently managed to mimic a natural system as closely as possible, providing several characteristics of a "natural" flow regime, including high springtime flows that are critically important for the June sucker, and augmented baseflows to avoid high temperatures and anoxic conditions that stress fish. This factor is similar for the three alternatives considered for this project.

Water Quality

Water quality is often overlooked in restoration projects because it is dictated largely by conditions that occur upstream within any river system. However, the importance of water quality issues in river restoration cannot be overstated. The outcome of a project will often be dictated by the quality of the water flowing within the channel. Every effort should be made to understand the water quality issues that affect a given system, and to use that understanding to determine the range of possible outcomes that are possible within that system. Also, design elements should be incorporated which will improve the water quality for downstream areas. The water quality of the Provo River provides a full range of restoration potential, so long as adequate baseflows are provided. This factor is similar for the three alternatives considered for this project.

Continuity

The term "continuity" refers to the longitudinal continuum of the channel and channel bed. Natural river channels tend to provide a longitudinal profile that is a continuum, that is, the profile changes smoothly along its length, and it has no major discontinuities that inhibit transfer of biota along a river's path. When the continuum is broken by marked anthropogenic changes in channel form or function, physical and ecological problems often occur.

Examples of continuity problems are dams and diversions, drop structures, bridges that cause channel constriction, and other features that disrupt the flow of energy or organisms through the system. These problems should be minimized within the project area and specific measures will be included under Alternatives 2A and 2B to avoid disruptions in continuity for June sucker and other species. Regarding this factor, Alternative 2B performs better than Alternative 2A.

Connectivity

The lateral connection between the river and its floodplain is referred to as its "connectivity". Rivers with good connectivity can overflow their banks during periods of high discharge. These periods of overbank flooding are extremely important for many organisms that live in riparian areas along river systems. Fine sediments are deposited onto the floodplain along with important nutrients. These new deposits provide excellent conditions for seedling establishment, which is extremely important for the sustainability of the riparian ecosystem. Alternatives 2A and 2B will be similar at improving the connectivity of the Provo river to its floodplain in many areas and enhancing riparian conditions where woody vegetation on the floodplain is allowable.

Complexity

Most river systems, which have been influenced by human activities, suffer from a lack of habitat complexity, both within the stream and along the margins. Natural levels of complexity, within aquatic and riparian ecosystems, provide the variety of habitat conditions that are necessary for survival of the entire suite of organisms that inhabit these systems. When complexity is diminished by human activities, fewer organisms can find the specific conditions which they require for survival, and thus, these organisms are lost from the system. Every effort should be made to restore appropriate natural levels of complexity within riverine ecosystems. This complexity will need to be the focus of detailed designs and will require careful integration of structural elements of the levee construction and reconstruction with features that enhance habitat diversity. Creation of June sucker spawning habitat will need to be a major focus of that diversity planning for Alternatives 2A and 2B. Regarding this factor, Alternative 2B performs better than Alternative 2A.

Dynamics

Perhaps the most ubiquitous problem for rivers in the western United States is the lack of channel migration and dynamics. Natural rivers migrate within their floodplains, and this migration often causes problems for adjacent landowners. The most common response to these problems involves attempting to stop the migration by lining channel banks with large rock (riprap). Although this approach can be effective at stopping channel migration, it is often extremely detrimental to the ecology of the system. Channel dynamics are necessary for many natural ecological functions, especially natural revegetation. For appropriate levels of channel dynamics to occur, restoration designs should not attempt to harden the channel in place, but rather, those designs should allow the channel to migrate within a prescribed area to the extent allowable. By letting some channel dynamics to occur, the long-term sustainability of the system is enhanced. Some detailed design will be needed to identify where limited dynamics can be allowed between the levees and where it cannot under Alternatives 2A and 2B.

Summary of Important Factors for Restoration

The location and constraints of Alternative 1 will not allow the important factors discussed above to be incorporated. The location and constraints of Alternatives 2A and 2B will allow the important factors discussed above to be more fully incorporated in final designs. Careful consideration should be given to each factor, and every effort made to include elements of them in the final designs at the maximum level appropriate, given other project goals.

APPENDIX F

Operations & Maintenance Manual

Preliminary Draft

WEST SIDE LEVEES OPERATIONS AND MAINTENANCE MANUAL

Please note that this document is in draft format. Text that is highlighted in yellow indicates that the content will be revised at a future stage of the project.

DRAFT

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PUBLIC WORKS
STORM WATER

January 2021

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CHAPTER 1 - **PURPOSE**

The purpose of this manual is to outline the proper operation and maintenance of the Provo City West Side Levees system, consisting of levees within Provo City adjacent to the Provo River west of I-15 and east of Utah Lake. See Figure 2-1 in Chapter 2 for the location of the West Side Levee System. This manual is intended to meet the requirements of 44 CFR 65.10 (d) *Maintenance Plans and Criteria*, as part of the overall documentation required for the Federal Emergency Management Agency (FEMA) certification of levees.

Larger improvements, repairs, or other alternatives planned for the West Side Levee system to provide a certifiable flood protection for the base (100-year) flood will be documented in the Provo City West Side Levee Plan. The purpose of this manual is to document the regular operation and maintenance of the levee system. It is anticipated the West Side Levee Plan will propose substantial improvements to the levees or alternative flood control measures. This manual should be updated as required to reflect the status of the levee system and its required operations and maintenance.

1.1 Supporting and Related Laws and Regulations

The following are guidance, laws, and regulations governing levee design and maintenance. Although the West Side Levee system is owned by Provo City and not by the USACE, USACE guidance was consulted in preparing this manual.

a. 44 CFR 65.10 Mapping of areas protected by levee systems. This section of the Code of Federal Regulations describes the type of information FEMA requires to show that a levee system provides protection from the base (100-year) flood.
b. Levee Owner's Manual for Non-Federal Flood Control Works (USACE, 2006). This manual is specifically intended for local, state, and tribal governments that have primary responsibility of flood control works. Its publication was directed by Public Law 104-303, the Water Resources Development Act of 1996.
c. Engineer Manual (EM) 1110-2-1913. This manual provides USACE guidelines for engineering design and construction of levees.
d. Engineer Manual (EM) 1110-2-301. This manual provides guidelines for landscape planting at Floodwalls, Levees, and Embankment Dams. This document provides additional clarification as to which types of vegetation are acceptable on and around flood control works.
e. Engineer Manual (EM) 1110-2-2705. This manual provides guidance on the design of closure structures for local flood control projects.
f. Engineer Manual (EM) 1110-2-1205. This manual provides information regarding environmental engineering for flood control channels.

1.2 City Responsibilities

As the owner of the levee system, Provo City is responsible for ongoing maintenance, preparedness activities, and flood response activities. The Storm Water team in the Public Services Division of Provo City Public Works has primary responsibility for the operation and maintenance of the West Side Levee system. Plans and budgets should be structured for regular operation and maintenance of project features, as well as for replacement of more expensive project components as they age or come to the end of their design life.

1.2.1 Annual Pre-Flood Season Inspections

This manual establishes an annual inspection program for the City Storm Water team to perform before spring runoff. Specific maintenance items and corrective actions are discussed in Section 3.3 Inspection Requirements and Checklists.

1.2.2 Permits

Routine maintenance activities such as log jam removal, tree trimming, etc. generally do not require permitting. However, it is important that modifications to the levee system or significant maintenance activities are reviewed and permitted by the appropriate parties before construction begins. See Chapter 4 for additional information regarding Permits.

1.2.3 Records

Records of permitted repairs and modification to the West Side Levee system are to be kept together with this manual in Appendix F. Permit documentation should include a summary of work performed, as well as the location on the City server of final drawings and specifications, surveys, and photographs for the project. This includes work performed by the City, as well as work by others such as installation of underground utilities, or additional storm water or irrigation outfalls affecting the levee system.

CHAPTER 2 – FEATURES OF THE PROJECT

2.1 Background and Description

2.1.1 Location

The West Side Levee system is located within Provo City adjacent to the Provo River west of I-15 and east of Utah Lake (see Figure 2-1 below). Levees are located on both the north and south sides of the Provo River from I-15 west to Lakeshore Drive. West of Lakeshore Drive, a levee is located on the south side of the Provo River which continues west towards the existing discharge to Utah Lake and crosses Center Street near the north end of the Provo City airport. The levee system then continues along Utah Lake west of the airport, and from there turns east and north to protect from the Provo Bay portion of Utah Lake.

The major source of flooding for the Provo River through Provo City is discharge from Deer Creek Reservoir during spring runoff, with some additional flows generated by snow melt below the reservoir. Intense rainfall within Provo City and Orem City also sometimes increases flows in the Provo River, though these intense storms typically occur later in the summer when flows are substantially lower than during spring runoff. The major source of high-water years in Utah Lake is high snowpack in the tributary watersheds. The major tributaries into Utah Lake are the Provo and Spanish Fork Rivers, with other minor tributaries including the American Fork River, Hobble Creek, and others. The Provo River and Spanish Fork River are highly regulated for water supply and include trans basin diversions.

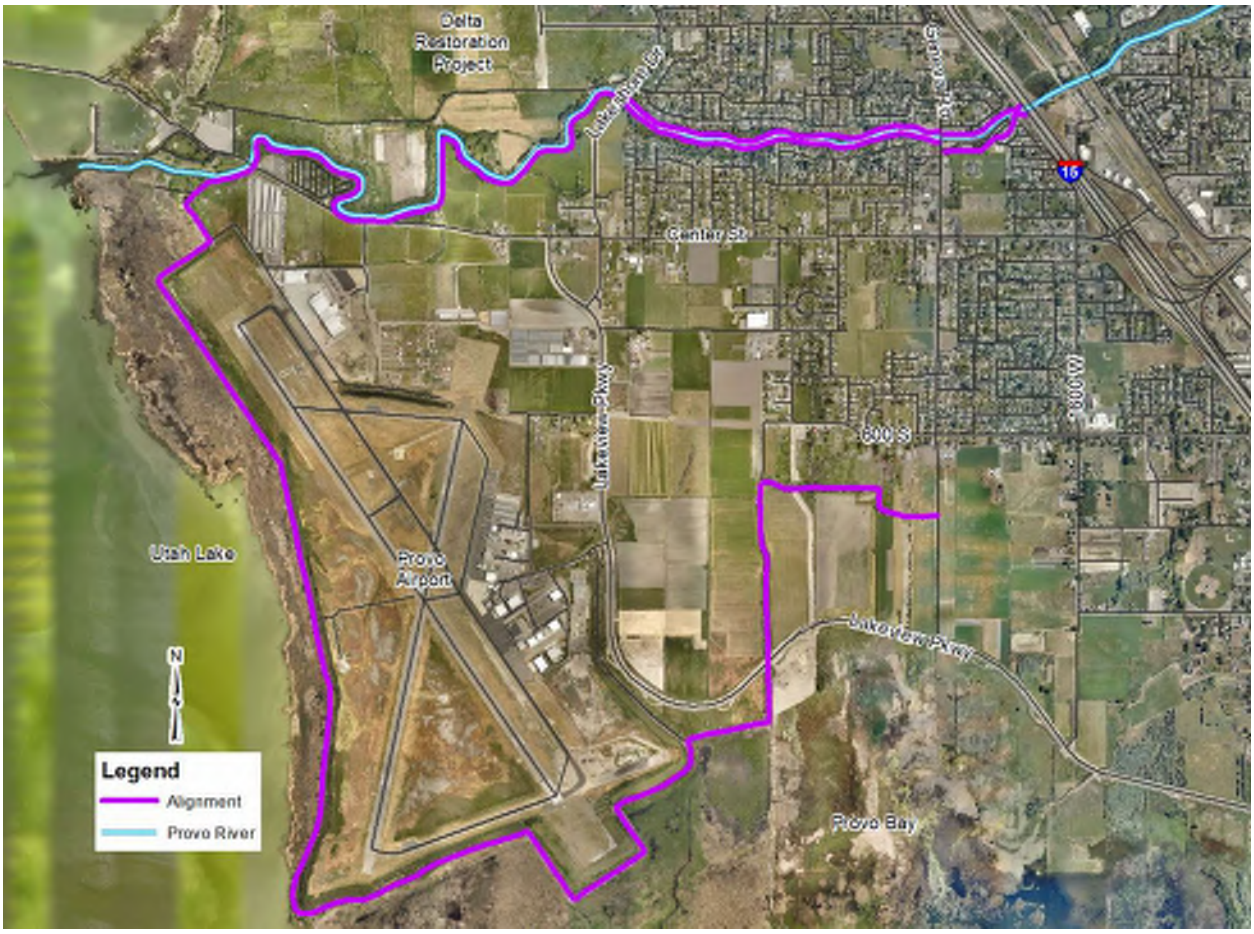


Figure 2-1: West Side Levee System Location Map

2.1.2 Protection Provided

The West Side Levee system provides flood protection to over 2,000 acres of land in Provo City. The protected area is comprised of residential, agricultural, commercial, parks, schools, churches, and the Provo City airport. Along the Provo River, the system, with improvements to be identified in the West Side Levee Plan, is intended to provide protection for the base (100-year) flow of 2,325 cfs plus required freeboard. Along Utah Lake, the system, with improvements to be identified in the West Side Levee Plan, is intended to provide protection for the base (100-year) NGVD 88 elevation of 4497.8' plus required freeboard.

2.2 Project Works

The principal flood control features of the West Side Levee system include:

1. The levees themselves (see Section 2.2.1)
2. The Provo River, which conveys the 100-year flood flows to Utah Lake (see Section 2.2.2)
3. Storm drains that convey flood flows through the levees to the Provo River or Utah Lake, and irrigation structures which divert flow from the River through the levees (see Section 2.2.3)
4. Two storm pump stations, which pump flow from the back side (or landside) of the levees into the Provo River or Utah Lake: (1) the Airport North Pump Station, and (2) the Riverview Pump station (see Section 2.2.4)

2.2.1 Levees

The West Side Levee system was constructed by the US Army Corps of Engineers (USACE) Sacrament District as an emergency measure for flood protection from the 1983-1984 high spring runoff in the Provo River and historic high Utah Lake levels. The 1983-1984 construction consisted of a combination of newly constructed levees and fortification of existing smaller levees. Since it was constructed as an emergency measure within a relatively short time frame before imminent flooding, a standard USACE certifiable design and construction sequence was not used. However, subsequent realignments for portions of the levee system at the north and south ends of the airport did use clay cores. Upon completion of the construction project, the levees were turned over to Provo City.

2.2.2 Provo River Typical Sections

Text

2.2.3 Drainage and Irrigation Structures

Text

2.2.4 Pump Stations

Airport North Pump Station

The Airport North Pump Station pumps storm runoff and groundwater from the airport moat, which is located on the land side of the West Side Levee system surrounding the Provo City airport. The airport moat system consists of mostly open waterways, connected by a series of culverts. The open waterways act as a linear detention system, detaining the water until it is pumped over the levees into Utah Lake by the three (3) pumps at the Airport North Pump Station. The three (3) pumps located at the Airport North Pump Station are as follows:

- Lead (Pump 1) – 3 Phase, 15 HP pump with a discharge capacity of ±300 GPM
- Lag (Pump 2) – 3 Phase, 40 HP pump with a discharge capacity of ±5,350 GPM
- 2nd Lag (Pump 3) - 3 Phase, 50 HP pump with a discharge capacity of ±7,000 GPM

The on/off elevations (NAVD 88) are as follows:

- Pump house floor = 4481.87'
- Lead (Pump 1) on = 4485.87'
- Lag (Pump 2) on = 4486.62'
- 2nd Lag (Pump 3) on = 4486.87'
- All off = 4485.12'

The discharge pipe flow line for Pump 1 into Utah Lake is 4502.79'. The discharge pipe flow lines for Pumps 2 & 3 into Utah Lake is 4502.62'. Therefore, all discharge pipes are more than 4' above the 100-year FEMA elevation for Utah Lake.

Riverview Pump Station

The Riverview Pump Station pumps storm runoff and groundwater from portions of the Riverview, River Meadows, Rio Vista, and Westar subdivisions. The storm drains in these areas convey storm flows and groundwater to an underground vault at the Riverview Pump Station, where is it pumped over the levee into the Provo River. The three (3) pumps located at the Riverview Pump Station are as follows:

- Lead (Pump 1) – X Phase, X HP pump with a discharge capacity of ±XXX GPM
- Lag (Pump 2) – X Phase, X HP pump with a discharge capacity of ±XXX GPM
- 2nd Lag (Pump 3) - X Phase, X HP pump with a discharge capacity of ±XXX GPM

The on/off elevations (NAVD 88) are as follows:

- Pump house floor = 4XXX.XX'
- Lead (Pump 1) on = 4XXX.XX'
- Lag (Pump 2) on = 4XXX.XX'
- 2nd Lag (Pump 3) on = 4XXX.XX'
- All off = 4XXX.XX'

The discharge pipe flow line for Pump 1 into Utah Lake is 4XXX.XX'. The discharge pipe flow lines for Pumps 2 & 3 into Utah Lake is 4XXX.XX'. Therefore, all discharge pipes are more than 4' above the 100-year FEMA elevation for Utah Lake.

CHAPTER 3 – OPERATIONS AND **MAINTENANCE – GENERAL PROCEDURES**

Flood control systems must be properly maintained to safeguard the protection they were designed to provide. This chapter outlines operation and maintenance activities to help the West Side Levee system maintain its flood control integrity and continued function. This includes inspection requirements, preventative maintenance measures, repairs that fall within the scope of regular maintenance, and guidance for determining when repairs are beyond the scope of regular maintenance.

Please also refer to the Operation and Maintenance Schedule (Appendix A), Inspections Checklists (Appendix B), Burrowing Animal Management Plan (Appendix C), Vegetation Management Plan (Appendix D), Inspection Documentation (Appendix E), and Permit Documentation (Appendix F).

3.1 Operations and Maintenance Activities vs. Permits

Routine maintenance activities such as log jam removal, tree trimming, and similar activities generally do not require permitting. However, some activities may occur within or near the levees which do require permits. These include:

1. Activities that alter the bed or banks of a natural stream require a Stream Alteration Permit with the Utah Division of Water Rights. The West Side Levee system along the Provo River essentially is the bank of the river.
2. Engineering Permits from Provo City Public Works are required for construction activities such as grading, utility installation, sidewalks, paved trails, and similar activities.
3. Dredging in the Provo River or Utah Lake, even for maintenance, is likely to require a USACE 404 Permit. Such activities may also trigger US Fish and Wildlife review, especially regarding potential impacts to the June sucker habitat and spawning areas.
4. Construction activities within the floodplain or that may affect the floodplain boundaries require a Floodplain Development Permit from the City Floodplain Administrator. Obtaining a Floodplain Development Permit may require submitting a Conditional Letter of Map Revision (CLOMR) to the City and FEMA. See Provo City Code 15.05.180 for additional information. CLOMRs also generally trigger US Fish and Wildlife review.

3.2 Annual Surveys

Annual surveys should be performed comparing cross sectional data with previous years to ensure the Provo River maintains its capacity, and the West Side Levee system maintains its integrity and required height. Comparisons will help identify general aggradation or degradation patterns in the Provo River and how they affect capacity and freeboard, potential erosion at the survey sites, and levee settlement. If potential issues are discovered, further investigation may be required. Repairs or other corrective actions may be taken, as deemed appropriate.

Annual surveys shall include cross sections at the following 7 locations. Survey pins or other markers shall be installed to facilitate consistency in the cross-section locations. For safety, annual surveys shall be performed during low Provo River flows to avoid the risk of injury or accident from high velocities.

1. Levee and river survey upstream of the Geneva Road Bridge.
2. Levee and river survey downstream of the Geneva Road Bridge.
3. Levee and river survey upstream of the Lakeshore Drive Bridge.
4. Levee and river survey downstream of the Lakeshore Drive Bridge.
5. Levee survey at the Airport North Pump Station.
6. Levee survey at the Dike Road turnoff to the airport tower.
7. Levee survey south of the levee crossing of Lakeview Parkway.

3.3 Inspection Requirements and Checklists

The Annual Inspections Checklist (included in Appendix B) shall be used for an annual pre-flood inspection, to be performed generally between January 1 and April 1 each year so it occurs before high spring outflows discharged from Deer Creek Reservoir. Inspections shall occur along the Provo River

levees daily for flows higher than 1,800 cfs (see Section 6.2 Operation During Flood Periods). Weekly inspections shall occur along the Utah Lake levees any time the water level is higher than an elevation of 4493.35' NAVD 88 Datum (i.e., 1.0' higher than Utah Lake compromise elevation). Inspections shall occur after a significant seismic event.

Monthly inspections should also be conducted for the Airport North and Riverview Pump Stations using the Monthly Pump Inspections Checklist (included in Appendix B).

Visual observations of the levees, Provo River, and irrigation and storm drain outfalls through the levees also occur by City Storm Water staff during the regular course of their work duties. If no problems are identified during these periodic visual observations, specific documentation is not required. However, documentation and maintenance or repairs are required if problems are found with any of the following:

On the levees:

- Settlement, sloughing, or loss of grade.
- Erosion on either side of the levee, whether on the face of the levee or at toe of slope.
- Degradation or damage to levee access roads or trails, or to access gates.
- Evidence of seepage.
- Evidence of burrowing animals.
- Woody or otherwise prohibited vegetation on the levees.
- Non-permitted construction that has encroached (within 10', above, or under) on the levees.

In the River:

- Debris that might clog the channel or storm drain outfalls.
- Noticeable change in aggradation or degradation.
- Compromised riprap or eroded areas.
- Damage or settlement to bridge structures including approaches, headwalls, etc.

On irrigation and storm drain outfalls:

- Debris or other obstruction of flow.
- Damage to or settlement of pipe.
- Damage to concrete headwall.
- Problems with backflow preventer.
- Problems with control gates or similar equipment.

Inspection reports, consisting of the completed Inspections Checklists, problems observed outside of an official inspection, and corrective actions taken shall be kept in Appendix E – Inspection Documentation.

3.4 Standards for Maintenance and Repairs

3.4.1 Regular Maintenance

Vegetation

Grasses, forbs, or similar low ground cover on levees help protect against erosion. Conversely, roots of trees or other woody vegetation can negatively affect the stability of levees and interfere with emergency operations during flood conditions. Tall vegetation, whether it is trees, shrubs, or simply overgrown knee-high grasses can make it difficult to properly inspect the levee. However, cutting the grass too short can inhibit its health and its ability to provide proper erosion protection.

Therefore, a good grass or similar ground cover should be maintained on the levees. The grass should be mowed to minimum height of 3", and it should be mowed so it reaches no more than 12" in height. Regular mowing can prevent the growth of trees and other woody vegetation. Trees and shrubs must be removed if they are on the levee or within 15' of the levee toe. Trees that reach 2" in diameter or greater must be cut down, the root ball removed, the voids fill in within clay or other impervious material, and the material firmly compacted and reseeded.

Riprap

Settled areas in riprap can indicate it is being undermined by flows, ice (on the Utah Lake levees), or debris. Uneven riprap protection can increase the flow turbulence, cause eddies, and increase potential

for further erosion. For settled or displaced riprap, replace or add riprap to restore an even slope. If unwanted vegetation is growing in the riprap where mowing is infeasible, control with an approved herbicide or remove by hand.

Riprap should be durable rock with a specific gravity of 2.5 or higher. It should generally be block shaped and angular, as round, thin, or elongated stone generally do not provide the same protection. Riprap should be sized to withstand the velocities associated with its protected area. Grouted riprap should be avoided except when necessary due its environmental impact, low aesthetic quality, and its tendency to fail quickly once the bond between the cement and stone is broken.

Gated Diversions and Storm Drain Outfalls
Gate systems for irrigation diversions and storm drain outfalls through the levee system need to be inspected and lubricated annually during the annual pre-flood inspection (see Section 3.3). Manually operate the gates to verify they are seated for proper sealing and remove any debris or vegetation. Check metal parts for rust, and clean and/or paint, as necessary. Also check metal parts for bending or cracking and replace if necessary. All concrete cracks in concrete structures need to be repaired.

Pump Stations
As stated in Section 3.3, the Airport North and Riverview Pump Stations should be inspected monthly. Regular maintenance during inspections includes manually running the pumps and checking the outflow for potential clogging; adjusting the lubrication, checking oil reservoir levels in the pumps, and oil level in the oil can/bucket at the Airport North Pump Station; and cleaning any buildup in the drain hole for the pumps' water reservoirs for the Riverview Pump Station. Regular maintenance also includes keeping the pump houses clean and in good repair, including making any necessary repairs to gates and locks. Discharge piping should be visually inspected as part of the pump station inspections. Timely repairs should be scheduled to replace any worn out or defective parts, or for any damage or degradation in the electrical system to the pump house.

Access Roads and Gates
Access roads and gates must be maintained in good repair for uninhibited access for regular inspections, repairs, and flood fighting. Potholes in paved access roads must be fixed. Severe ruts and depressions on unpaved access roads on the top of levees allow repeated ponding, which can regularly seep into and saturate the levee's interior, making it more susceptible to failure. To correct this, roughen the top of the levee and smooth it out in an even layer. Add water or dry the backfill as necessary to attain optimal moisture content, and compact in ±6" layers. For unpaved areas where the top of levee is used for pedestrian trails or flood fighting access, a gravel layer should be maintained at the top to reduce susceptibility to depressions and rutting.

3.4.2 Major Repairs to Levee Embankments
Slope failure such as slumping, severe erosion after a flood event, or excessive cracking (more than just near the surface, and/or spreading to a significant section of levee) will likely require removing and rebuilding a section of levee. If this occurs, an engineer with experience in levee repair should be consulted to determine the appropriate method for fixing the problem, including extents of the repair, materials to be used, compaction requirements, and any other measures required to mitigate the source of the problem.

3.4.3 Depredations of Burrowing Animals
Burrows from animals can lead to rapid levee failure during floods. Close attention must be paid during inspections to the presence of burrowing animals. Animal burrows that are identified should be thoroughly excavated and inspected, backfilled with soil that is like the existing levee material, and revegetated. Traps should be set, or bait stations established for rodent control. Contact the local Utah Division of Wildlife Resources to determine which rodent control procedures are recommended and allowable.

Beavers also pose a concern on the lower Provo River reaches, by creating dams or blocking culverts, and burrowing into the levee. Beavers should be removed immediately, and their dams removed.

Chapter 4 - **PERMITS**

4.1 City Permits

Floodplain development permit

Engineering permits

4.2 Permitted Activities

Text

4.3 Other Permits to Consider

Other permits or clearances may be required for a project, including, but not limited to, the list included in Table 4-1 below.

Table 4-1 Other Permits and Clearances

Permit/Clearance	**Granting Agency**
Federal Permits, Reviews, and Approvals	
Section 404 Permit Discharge of Dredged or Fill Materials into Waters of the U.S. including Wetlands	USACE
Section 401 Certification Water Quality Certification	Utah Division of Water Quality
Section 402 Permit Utah Pollution Discharge Elimination System (UPDES)	Utah Division of Water Quality
Endangered Species Act Section 7 Consultation and Biological Assessment /Incidental Take Statement	U.S. Fish and Wildlife Service
National Historic Preservation Act (Section 106)	Utah State Historic Preservation Office and Advisory Council on Historic Preservation
State Permits, Reviews and Clearances	
Stream Channel Alteration Permit	Utah Division of Water Rights
Certificate of Registration	Utah Division of Wildlife Resources
Approval of Remediation Work Plan	Utah Department of Environmental Quality or the U.S. Environmental Protection Agency

4.4 Non-Compliant Permits

Permittees are to comply with all conditions of the applicable permit. Any permit in non-compliance constitutes a violation and is grounds for enforcement action including permit suspension or revocation. The Permittee is to give advance notice of any planned changes in the permitted activity.

CHAPTER 5 – **ENFORCEMENT**

Text

5.1 Right-of-Way, Easements

Need to add specifics of right-of-way and easements for the levees into the Provo City Code

5.2 Encroachments

Need to prohibit encroachment on the levees to Provo City Code

CHAPTER 6 – EMERGENCY PROCEDURES

Along the Provo River, high water generally occurs with at least several days if not weeks of prior notice. The Jordanelle and Deer Creek dams coordinate outflows based on minimum flows required per agreements, water users' needs, and the status of snowpack in the Provo River basin. Meetings are held regularly with stakeholders. Emergency response is coordinated by the Emergency Management Coordinator in the Provo City Fire Department, with flood control assistance from Storm Water personnel in Provo City Public Works.

Utah Lake levels are controlled by court decree, water rights, and various agreements. The operation of the outlet to Utah Lake, reservoirs on the Provo River, and trans basin diversions from Strawberry Reservoir should be monitored and coordinated during times of high-water levels in Utah Lake.

6.1 Preparation for Flood Periods

The West Side Levee Emergency Action Plan (EAP) [TO BE DELEVOPED] was produced using USACE *Guidance for Emergency Action Plans, Incident Management and Reporting, and Inundation Maps for Dams and Levee Systems* and the US Department of Homeland Security's Emergency Preparedness Guidelines for Levees: A Guide for Owners and Operators. The EAP is included in Appendix G.

In the event of a levee threat or flood, the Provo City Fire Department Emergency Management Coordinator and Public Works Storm Water teams should be contacted immediately. Response will be determined by threat level and the flow charts contained in the EAP.

6.2 Operation During Flood Periods

During flood periods, the levees are to be inspected to locate possible sand boils or unusual wetness of the landside slope to be certain that:

1. There are no indications of slides or sloughs developing;
2. Wave wash or scouring action is not occurring;
3. No low reaches of levee exist which may be overtopped; and
4. No other conditions exist which might endanger the structures.

Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

Public Works Storm Water staff shall perform inspections along the Provo River levees at least weekly any time the USGS gauge near Boat Harbor Drive indicates Provo River flows higher than 1,100 cfs, and daily for flows higher than 1,800 cfs. They shall perform inspections along the Utah Lake levees at least weekly any time the water level is more than 4493.35' NAVD 88 Datum (i.e., 1.0' higher than Utah Lake compromise elevation).

6.3 Preliminary Repair Work

After the initial inspection and condition of the levees have been assessed, Storm Water staff shall take immediate action if the following work is necessary:

1. Fill up holes or washes in the levee crown, slopes, and landside berms;
2. Repair and close all flap gates on culverts and see that they are seated properly before they are covered with flood waters;
3. Ascertain that all roads to and along the levee are in a good state of repair;
4. Locate necessary tools and materials (sand, sacks, sandbags, brush, lumber, lights, etc.), and distribute and store the same at points where active maintenance is anticipated;
5. Check all communications lines necessary for operation, obtain lists of all team forces and transportation that can be made available;

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6. Communicate directly with owners of all stock pastured on the levee and direct that all stock be removed from the levee right-of-way. Cut all fences crossing the levee that do not have gates provided;
7. Inspect drainage ditches on landside of the levee and open drains if obstructed.

6.4 Flood Fighting and Levee Topping

After the preliminary organization and precautions have been completed, the "flood fight" itself begins. Information regarding flood fighting techniques on levees is provided in the EAP (Appendix G).

CHAPTER 7 – **REFERENCES**

USACE, 2006. Levee Owner's Manual for Non-Federal Flood Control Works. The Rehabilitation and Inspection Program. Public Law 84-99. March 2006.

Appendix A--Operation and Maintenance Schedule

Appendix B--Inspections Checklists

Appendix C--Burrowing Animal Management Plan

Appendix D--Provo West Side Levee Vegetation Management Plan

Vegetation management is necessary to protect the new levees and to make the project more desirable from a variety of permitting and NEPA perspectives. A good vegetation management plan will not only minimize construction impacts to the ecosystem, but it could also be used to demonstrate improvements to existing conditions of the project area for known listed species such as June sucker, Yellow-billed cuckoo (YBC), and Utes ladies' tresses (ULT).
The overall approach will include pre-construction noxious/invasive species control, "selective" tree removal (essential where construction will occur), and salvage/relocation of desirable plants and soils where practical during the construction phase. Revegetation will be accomplished by preparing the soil once final grades are constructed, seeding, mulching, and planting as soon as possible after construction is completed.

Temporary or permanent irrigation should be considered to help improve the revegetation success where possible. Weed control will need to be ongoing indefinitely in the operation and maintenance plan, with initial intense weed treatments 4-5 times/year for the first five years, and then 2-3 times/year thereafter to make sure the revegetated areas are dominated by the desirable species specified in the plan, and to eliminate woody vegetation from growing on the new levees.

All disturbed areas will be broadcast seeded with appropriate mixes based on frequency and duration of inundation. More expensive plantings will be strategically located. General categories are upland >5-yr flood elevation, riparian 1 to 5-yr flood elevation, and wetland are seasonally saturated annually. There will be a variety of strategies for planting depending on final selected species.

There will need to be an airport/Federal Aviation Administration (FAA) review of draft species lists, and some "wildlife attractant" restrictions are anticipated depending on proximity to the airport.

The revegetation process will follow these basic steps:

1. Pre-construction weed treatment. Invasive and noxious weeds should be treated and/or seed heads removed before construction begins to minimize seed sources to disturbed soils and to minimize future weed outbreaks.

2. Pre-construction vegetation (tree) removal. This could be extensive depending on the alternative. All heavy vegetation would be removed within 15' of the new levee toe-of-slope. Other invasive species would be removed on a selective basis depending on final levee alignment. However, the existing 2-yr floodplain along the river can likely remain mostly forested.

3. Post-construction seeding. Native species lists have been developed for levee uplands (no woody species), non-levee uplands, riparian areas, and wetlands. Native species are recommended because they are a better long-term solution to these sensitive habitats and provide better success rates. There are nearby cottonwood trees and other native trees and shrubs, natural cottonwood recruitment will be promoted. The seeded soils will be covered and protected using a hydro mulch with tackifier, to be applied immediately following seeding. It is possible that a flood will occur the first year before the seed becomes established. If this happens, it is possible that a second seeding effort would be needed to re-seed flooded areas.

4. Post-construction planting. A native species planting plan will be prepared. Once the disturbed soils have been seeded and mulched then the area will be ready for cuttings and plantings. Since construction will likely impact some desirable plants, salvaging and moving them during the construction phase has many benefits and will be considered if practical. Plantings do best if they are installed either in the fall or spring, however, sometimes it is better in flood-prone areas to wait until the receding limb of spring runoff to make sure the new plants do not get washed away. These details will be included in the revegetation plan.

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5. Post-construction weed control. Weeds always invade disturbed soils after construction. A variety of weed control efforts will be needed, including spraying noxious weeds, removing seed heads, and physically pulling weeds seasonally.

6. Ideas for filling open water and wetlands surrounding the airport include native upland grasses to be mowed, or sagebrush/rubber rabbitbrush.

Preliminary native species lists

Upland seed mix to be used on new levees and within 15' of toe-of-slope (without woody veg)

SEED NO.	SPECIES NAME		SEEDS PER POUND	DRILL SEED		
	Botanical Name	Common Name		Pounds of pure live seed per acre	Percent of mix	Seeds per square foot
1	*Pseudoroegneria spicata*	Bluebunch wheatgrass				
2	*Elymus trachycaulus*	Slender wheatgrass				
3	*Elymus elymoides*	Bottlebrush squirreltail				
4	*Koeleria macrantha*	Prairie junegrass				
5	*Poa secunda* ssp. *Sandbergii*	Sandberg bluegrass				
6	*Pascopyrum smithii*	Western wheatgrass				
		Great Basin wildrye				
7	*Linum lewisii*	Lewis blue flax				
8	*Geranium viscosissimum*	Wild geranium				
9	*Asclepias speciosa*	Showy milkweed				
10	*Cleome serrulata*	Rocky Mountain beeplant				
11	*Penstemon strictus*	Rocky Mountain penstemon				
12	*Penstemon eatonii*	Firecracker penstemon				
13	*Sphaeralcea coccinea*	Scarlet globemallow				
	TOTAL					

Upland revegetation target species (with woody veg).

SPECIES	SCIENTIFIC NAME	WATER REQUIREMENTS
Western wheatgrass	*Pascopyrum smithii*	Early growing season saturation and flooding to well drained
Bluebunch wheatgrass	*Pseudoroegneria spicata*	Well drained
Slender wheatgrass	*Elymus trachycaulus*	Well drained
Bottlebrush squirreltail	*Elymus elymoides*	Well drained
Prairie junegrass	*Koeleria macrantha*	Well drained
Sandberg bluegrass	*Poa secunda* ssp. *sandbergii*	Well drained
Wild geranium	*Geranium viscosissimum*	Early growing season saturation to well drained
Great Basin wildrye		
Rocky Mountain penstemon	*Penstemon strictus*	Well drained
Firecracker penstemon	*Penstemon eatonii*	Well drained
Scarlett globemallow	*Sphaeralcea coccinea*	Well drained
Rocky Mountain beeplant	*Cleome serrulata*	Well drained
Lewis blue flax	*Linum lewisii*	Well drained
Rubber rabbitbrush	*Ericameria nauseosa*	Well drained
Skunkbush sumac	*Rhus trilobata*	Moist soil to well drained
Golden currant	*Ribes aureum*	Early growing season flooding then well drained
Big sagebrush		
Antelope bitterbrush		

Box elder	*Acer negundo*	Early growing season flooding then well drained
Fremont cottonwood	*Poplantingslus fremontii*	Brief flooding and soil saturation then well drained

Riparian revegetation target species

COMMON NAME	SCIENTIFIC NAME	PREFERRED HABITAT	ESTABLISHMENT METHOD
Meadow sedge	*Carex praegracilis*	Early growing season flooding to permanent soil saturation	Seed and plugs/containerized
Inland saltgrass	*Distichlis spicata*	Early growing season saturation and flooding	Seed
Arctic (Baltic, mountain, wiregrass) rush	*Juncus arcticus (balticus)*	Early growing season flooding to permanent soil saturation	Seed and plugs/containerized
Western wheatgrass	*Pascopyrum smithii*	Early growing season saturation and flooding to well drained	Seed
Wild geranium	*Geranium viscosissimum*	Early growing season saturation to well drained	Seed
Thickspike wheatgrass	*Elymus lanceolatus*	Brief flooding to well drained	Seed
Nuttall's alkaligrass	*Puccinellia nuttalliana*	Early growing season flooding to permanent soil saturation	Seed
Rocky Mountain beeplant	*Cleome serrulata*	Well drained	Seed
Virginia wildrye	*Elymus virginicus*	Well drained	Seed
Scarlet globemallow	*Sphaeralcea coccinea*	Well drained	Seed
Butterfly weed			
Lewis blue flax	*Linum lewisii*	Well drained	Seed
Wild geranium	*Geranium viscosissimum*	Well drained	Seed
Showy milkweed	*Asclepias speciosa*	Well drained	Seed and containerized
Swamp milkweed	*Asclepias incarnata*	Grows best in damp to wet soil	Seed and containerized
Rubber rabbitbrush	*Ericameria nauseosa*	Well drained	Seed
Alkali sacaton	*Sporobolus airoides*	Prefers moist but not saturated soils	Seed
Oregon grape			
Serviceberry			
Snowberry			
Chokecherry			
Golden currant	*Ribes aureum*	Early growing season flooding then well drained	Seed and containerized
Skunkbush sumac	*Rhus trilobata*	Moist soil to well drained	Seed and containerized
Coyote willow	*Salix exigua*	Significant flooding to nearly permanent soil saturation	Containerized and cuttings[a]
Bebb's willow	*Salix bebbiana*	Significant flooding to nearly permanent soil saturation	Containerized and cuttings[a]
Yellow willow	*Salix lutea*	Significant flooding to nearly permanent soil saturation	Containerized and cuttings[a]
Peachleaf willow	*Salix amygdaloides*	Significant flooding to nearly permanent soil saturation	Containerized and cuttings[a]
Redosier dogwood	*Cornus sericea*	Early growing season flooding then well drained	Containerized and cuttings[a]
River birch			
Thinleaf alder	*Alnus incana*	Early growing season flooding then well drained	Containerized
Box elder	*Acer negundo*	Early growing season flooding then well drained	Containerized
Big tooth maple			
Hawthorn			
Fremont cottonwood	*Poplantingslus fremontii*	Brief flooding and soil saturation then well drained	Containerized and cuttings[a]*

Emergent wetland revegetation target species.

COMMON NAME	SCIENTIFIC NAME	ESTABLISHMENT METHOD
Hardstem bulrush	*Schoenoplectus acutus*	Seed and plugs/containerized
Olney's three-square bulrush	*Schoenoplectus americanus*	Seed and plugs/containerized
Giant bur reed	*Sparganium eurycarplantingsm*	Seed and plugs/containerized
Nebraska sedge	*Carex nebrascensis*	Seed and plugs/containerized
Arctic (Baltic, mountain) rush	*Juncus arcticus* (*balticus*)	Seed and plugs/containerized

Spikerush	*Eleocharis palustris*	Seed and plugs/containerized
Alkali bulrush		
Broadleaf arrowhead		
Marsh buttercup		
Water sedge	*Carex aquatilis*	Seed and plugs/containerized
Swamp milkweed	*Asclepias incarnata*	Seed and plugs/containerized
Coyote willow	*Salix exigua*	Containerized/cuttings

Preliminary weed list

Noxious and invasive plant species treatment priorities.

PRIORITIES FOR TREATMENT		
High	**Moderate**	**As Encountered or Watch List**
1. Phragmites australis (Phragmites)	*14. Lepidium latifolium (perennial pepperweed)*	24. *Ambrosia artemisifolia* (annual ragweed)
2. Phalaris arundinacea (reed canarygrass)	*15.Echinochloa crus-galli* (barnyard grass)	*25. Bassia scoparia* (burningbush)
3. Myriophyllum spicatum (Eurasian water milifoil)	*16. Nasturtium officinale*[a] (water-cress)	*26. Bromus tectorum*[a] (cheatgrass)
4. Potamogeton crispus (curly leafed pondweed)	*17. Cardaria draba* (hoary cress)	*27. Chenopodium berlandieri* (lambsquarters)
5. Didymosphenia geminata (rock snot)	*18. Arctium minus* (burdock)	*28. Cirsium vulgare*[a] (bull thistle)
6. Cirsium arvense (Canada thistle)	*19. Cynoglossum officanale* (houndstongue)	*29. Dipsacus fullonum* (Fuller's teasel)
7. Elaeagnus angustifolia (Russian olive)	*20. Elymus repens* (quackgrass)	*30. Aegilops cylindrica* (jointed goatgrass)
8. Carduus nutans (musk thistle)	*21. Convolvulus arvense* (field bindweed)	*31. Lythrum salicaria* (purple loosestrife)
9. Onopordum acanthium (scotch thistle)	*22. Xanthium strumarium* (cocklebur)	
10. Tribulus terrestris (puncturevine (goathead))	*23. Lactuca serriola* (prickly lettuce)	
11. Tamarix ramosissima / chinensis (saltcedar)		
12. Ulmus pumila[a] (Siberian elm)		
13. Salix fragilis[a] (crack willow)		

[a] Non-indigenous plant species known to be problematic within the project area, not listed by the State or Utah County as "noxious".

An additional recommendation is that during construction, mechanical treatment such as grading or tilling by the construction contractors, or the use of a non-selective herbicide such as glyphosate with a limited active duration may be appropriate for controlling weeds prior to replanting. Selective broadleaf herbicide such as 2,4-D can be used on non-woody levees.

Hand pulling of Russian olive seedlings and other weeds can take place at any time. A weed wrench or similar tool can be useful for pulling the seedlings if needed. During the spring and early summer, a shovel can be used to dig up the rosettes of biannual weeds including musk thistle, bull thistle, Scotch thistle, houndstongue, and burdock. Perennial plants with extensive root systems including Canada thistle and leafy spurge should not be dug up.

Appendix E--Inspection Documentation

Appendix F--Permit Documentation

Appendix G—Emergency Action Plan (EAP)

PROVO MUNICIPAL COUNCIL STAFF REPORT

Submitter: MISANDERS
Department: Council
Requested Meeting Date: 07-20-2021

SUBJECT: A discussion regarding a Municipal Council Handbook Amendment (21-086)

RECOMMENDATION: Presentation and discussion; action by majority vote of the Council.

BACKGROUND: Pursuant to UCA 52-4-207, the Municipal Council has a policy enabling attendance by electronic communications, which prior to the COVID-19 pandemic had only consisted of traveling councilors calling in via telephone to meetings. Over the past 16 months, the use of video conferencing for meetings has widely used and of such high quality and convenience during the pandemic that Council leadership and Council staff intend to continue using Zoom to enable public comment in the regular meetings, enable some presenters to make their presentations virtually, and enable attendance for those elected officials or staff who want or need to participate despite travelling. The medium is so convenient that many have asked why return to: [insert work, church, public meetings, etc. here]. Council leadership suggests additional language be added to the policy making clear that in person attendance is expected whenever possible. The proposed policy, included under Part IX: Rules and Procedures for Meetings, at 2.b.i, would add the final sentence below to the policy as follows:

i. Electronic Meetings

This rule was adopted to satisfy UCA 52-4-207: Electronic Communications. Council Members may, on occasion, participate in Council meetings by electronic communication if the required technology is available and the meeting is legally noticed in accordance with the Utah State Law. The Council must provide space and facilities at a location where the public may attend, monitor and participate in the open portions of the meetings as specified in UCA 52-4-207.

It is the expectation of the Municipal Council that each councilor should regularly attend regular and work meetings in person whenever possible, and participate by electronic communication only when necessitated by business-related or personal travel, personal or family illness, or when an electronic meeting is the only available option.

FISCAL IMPACT: none

PRESENTER'S NAME: Cliff Strachan, Council Executive Director

REQUESTED DURATION OF PRESENTATION: 5 minutes

COMPATIBILITY WITH GENERAL PLAN POLICIES, GOALS, AND OBJECTIVES:

CITYVIEW OR ISSUE FILE NUMBER: 21-060

PROVO CITY MUNICIPAL COUNCIL

Staff Memorandum

Cliff Strachan, Executive Director

Handbook Amendment: Electronic Meetings (021-086)

July 13, 2021

PROPOSED POLICY AMENDMENT

Add the following phrase to the Council's policy on Electronic Meetings:

"It is the expectation of the Municipal Council that each councilor should regularly attend regular and work meetings in person, whenever possible, and participate by electronic communication only when necessitated by business-related or personal travel, personal or family illness, or when an electronic meeting is the only available option."

BACKGROUND

Over the past 16 months, the use of video conferencing for meetings has been regularly and widely used and of such high quality and convenience during the pandemic that Council leadership and Council staff intend to continue using Zoom to enable public comment in the regular meetings, enable some presenters to make their presentations virtually, and enable attendance for those elected officials or staff who want or need to participate despite travelling.

In considering the return to in person meetings and multiple statements from citizens, elected officials, and staff concerning the convenience and availability of video conferencing for a variety of meetings, supportive of continuing to have option available for use, staff began discussing the possible benefits and consequences of doing so. One conversation I had with a peer outside Provo was how to handle a situation (the peer had raised) where an elected official liked the convenience of Zoom meetings so much that the official refused to return to in person meetings.

The simplest answer is to set the expectation, which is what the proposed policy amendment does.

Pursuant to UCA 52-4-207, the Municipal Council already has a policy enabling attendance by electronic communications, which prior to the COVID-19 pandemic had consisted of traveling councilors calling in via telephone to meetings. Council leadership suggests additional language be added to the policy making clear that in person attendance is expected whenever possible.

If the proposed amendment were adopted by the Council, the policy, included under Part IX: Rules and Procedures for Meetings, at 2.b.i, would read:

i. Electronic Meetings

This rule was adopted to satisfy UCA 52-4-207: Electronic Communications. Council Members may, on occasion, participate in Council meetings by electronic communication if the required technology is available and the meeting is legally noticed in accordance with the Utah State Law. The Council must provide space and facilities at a location where the public may attend, monitor, and participate in the open portions of the meetings as specified in UCA 52-4-207.

It is the expectation of the Municipal Council that each councilor should regularly attend regular and work meetings in person, whenever possible, and participate by electronic communication only when necessitated by business-related or personal travel, personal or family illness, or when an electronic meeting is the only available option.

LIMITATIONS

The proposed amendment merely sets the expectation and relies on the goodwill of any elected official to adhere to the policy.

If there is or were to be a concern that the policy might be abused, the Council might choose, now or later, to:

i) Rescind the policy and allow no electronic participation, or
ii) Add some mechanism of permission to the policy.

PROVO MUNICIPAL COUNCIL STAFF REPORT

Submitter: MISANDERS
Department: Council
Requested Meeting Date: 07-20-2021

SUBJECT: A presentation on Projects Funded by the Innovation Fund (21-085)

RECOMMENDATION: Presentation only

BACKGROUND: The Innovation Grant Fund Program was created several years ago to encourage our employees to think outside the box and be innovative in their approach to their jobs or challenges. The program successfully launched one round of initiatives/ideas. In late 2019, the program was re-initiated and the program began promoting and soliciting Provo City employees to submit innovative ideas. The criteria for selecting an innovative idea were as follows:
- cost savings to Provo City as a whole
- cost savings to individual departments
- service and quality improvement to Provo residents
- increased efficiency
- contribution to public safety or quality of life and finally
- innovation or a compelling concept

This presentation will focus on a broad report on innovation funds uses and results.

FISCAL IMPACT: none

PRESENTER'S NAME: Dixon Holmes, Assistant CAO

REQUESTED DURATION OF PRESENTATION: 10 minutes

COMPATIBILITY WITH GENERAL PLAN POLICIES, GOALS, AND OBJECTIVES:

CITYVIEW OR ISSUE FILE NUMBER: 21-085

PROVO MUNICIPAL COUNCIL STAFF REPORT

Submitter: MISANDERS
Department: Council
Requested Meeting Date:

SUBJECT: A discussion regarding the Neighborhood Program. (21-071)

RECOMMENDATION: Make a decision on the composition of the committee reviewing the Neighborhood Program and define the scope of work to be undertaken in reviewing the Neighborhood Program.

BACKGROUND: During the Work Meeting on June 15, 2021, the Council heard a presentation regarding the Neighborhood Program. As part of the discussion the Council heard about several problems the program is encountering and possible reasons why the problems may have arisen. The item was continued for further discussion and direction from the Council on how best to address these problems. The Council needs to decide on the best move forward. This would include deciding on or if a committee should be formed to address the issues as well as deciding what aspects of the program need to be reviewed.

FISCAL IMPACT: None

PRESENTER'S NAME: Cliff Strachan, Council Executive Director

REQUESTED DURATION OF PRESENTATION: 30 minutes

COMPATIBILITY WITH GENERAL PLAN POLICIES, GOALS, AND OBJECTIVES:

CITYVIEW OR ISSUE FILE NUMBER: 21-071

Chapter 2.29
NEIGHBORHOOD PROGRAM

Sections:

2.29.010 Neighborhood Organizations Created.
2.29.020 Purposes.
2.29.025 Duties.
2.29.030 Organization.
2.29.040 Neighborhood Meetings.
2.29.050 Matching Grant Review Process.
2.29.060 Neighborhood Chair Fee Waivers.

2.29.010 Neighborhood Organizations Created.

(1) *Neighborhoods and Neighborhood Areas.* There are hereby established geographic areas within the City which shall be known as Neighborhoods and Neighborhood Areas as shown on an Official Neighborhood Map[1] adopted by the Municipal Council and which by this reference is made a part of this Chapter. The term "Neighborhood" means a geographically distinct portion of the City which is represented by a Neighborhood Chair as set forth in this Chapter. The term "Neighborhood Area" means four (4) or more geographically adjacent Neighborhoods. The boundaries of Neighborhoods and Neighborhood Areas shall be determined by the Municipal Council and shall appear on the Official Neighborhood Map.

(2) *Neighborhood Area Councils.* A Neighborhood Area Council is hereby created for each Neighborhood Area. Each Neighborhood Area Council shall consist of Chairs from each Neighborhood located within the boundaries of the Neighborhood Area as shown on the Official Neighborhood Map. Each Neighborhood Area Council shall elect one (1) member who shall serve as the Area Representative and a different member who shall serve as the Assistant Area Representative.

(3) *Neighborhood Advisory Board.* A Neighborhood Advisory Board is hereby created. The Neighborhood Advisory Board shall be a Municipal Council Board and shall consist of no more than nine (9) members, made up of:

(a) Each Area Representative or their designated replacement (as described in Section 2.29.030(2), Provo City Code);

(b) A Municipal Council Member appointed by the Municipal Council to serve as Chair of the Board;

(c) Up to two (2) additional Municipal Council Members appointed by the Municipal Council; and

(d) Other persons recommended by the Board and appointed by the Municipal Council.

(4) *Neighborhood Program.* The Neighborhood organizations and their associated activities created by this Chapter shall be referred to as the Neighborhood Program.

(Rep&ReEn 2000-34, Am 2015-47, Am 2017-12, Am 2017-55, Am 2019-12)

1 Code reviser's note: Ordinances 2017-12 and 2019-12 amend the Neighborhood Map adopted by reference in this chapter.

2.29.020 Purposes.

(1) *Neighborhoods.* The purposes of organizing the City into Neighborhoods are as listed below:

(a) Identify and build on the strengths and assets of each Neighborhood in order to solve local problems and meet local needs and desires;

(b) Bring Neighborhood residents and other local stakeholders (including Neighborhood businesses and residential landlords) together to achieve the shared goals of the Neighborhood;

(c) Develop Neighborhood-focused policy and legislative recommendations to the Municipal Council;

(d) Work together with the Municipal Council to develop programs, initiatives, and remedies in partnership with City administrative departments and other pertinent organizations;

(e) Provide each Neighborhood with a direct line of communication to and from the Municipal Council and Mayor through the Neighborhood Chair; and

(f) Address any other goals of the Neighborhood Program as determined by the Municipal Council.

(2) The Neighborhood Program is intended to provide advice and recommendations to the Municipal Council to aid them in their decision making, and to provide the citizens of Provo additional opportunities for input and feedback regarding land use decisions that affect their communities. The Neighborhood Advisory Board is not a legislative body. Area Representatives, Neighborhood Chairs, and Vice-Chairs are not elected officials and do not have any implied legislative or executive authority.

(Rep&ReEn 2000-34, Am 2015-16, Am 2015-47, Am 2017-55)

2.29.025 Duties.

(1) *Neighborhood Chairs.* The Neighborhood Chairs shall inform Neighborhood residents of current City issues on a regular basis. The Neighborhood Chairs shall survey Neighborhood strengths, assets, needs, recommendations, and problems and shall provide a summary of such to the Municipal Council and the Mayor. Neighborhood Chairs shall also assist the Council and Administration in the implementation and operation of Neighborhood-related City programs, initiatives, and projects in their Neighborhoods as requested.

(2) *Neighborhood Area Councils.* The Neighborhood Area Councils shall work together to achieve the purposes articulated in Section 2.29.020, Provo City Code. Area Representatives and Assistant Area Representatives shall communicate current City issues to the Neighborhood Chairs within their Neighborhood Area and report issues raised by Neighborhood Chairs back to the Municipal Council and the Mayor.

Neighborhood Chairs Seminar. The Municipal Council Executive Director shall organize a training seminar for all Neighborhood Chairs at least twice a year.

Neighborhood Area Council Meeting. Each Area Representative should convene a Neighborhood Area Council Meeting at least twice a year to which all Neighborhood Chairs in the Neighborhood Area shall be invited. Such meetings may be held as breakout sessions before or after a Neighborhood Chairs Seminar. Area Representatives shall gather information on Area needs and recommendations from Neighborhood Chairs and shall provide such information to the Municipal Council and the Mayor. Area Representatives shall also assist the Council and the Mayor in the implementation and operation of Area-related City programs, initiatives, and projects in their Neighborhood Area as requested.

(3) *Neighborhood Advisory Board.* The Neighborhood Advisory Board shall assist Neighborhood Chairs and Area Representatives in achieving the purposes articulated in Section 2.29.020, Provo City Code.

(a) In addition, the Neighborhood Advisory Board shall have the following duties:

(i) Make recommendations to the Municipal Council on the operation, programs, and policies of the Neighborhood Program;

(ii) Review requests for a waiver of land use application fees by a Neighborhood Chair as provided in Section 2.29.060, Provo City Code;

(iii) Receive, review, and recommend for approval or rejection Neighborhood matching-fund applications according to procedures established by the Municipal Council and the provisions of Section 2.29.050, Provo City Code; and

(iv) As requested by the Municipal Council, when a Neighborhood plan is submitted by the Community and Neighborhood Services Department, recommend persons to the Municipal Council to be appointed to a citizen commission charged with reviewing the plan and making recommendations to the Municipal Council regarding the plan.

(b) Also, individual members of the Neighborhood Advisory Board may:

(i) Make recommendations to Council staff regarding the timing of meetings to elect Neighborhood Chairs and Vice-Chairs, and Area Representatives and Assistant Area Representatives;

(ii) Conduct election meetings when requested by Council staff.

(Enacted 2015-16, Am 2015-47, Am 2017-55, Am 2019-03, Am 2020-57)

2.29.030 Organization.

(1) *Neighborhood.* Each Neighborhood shall be guided by the provisions of this Subsection.

(a) In a meeting held under the direction of the Municipal Council Executive Director, each Neighborhood shall elect its Chair and one (1) to three (3) Vice-Chairs, subject to the availability of residents willing to serve. Vice-Chairs serve in the absence of the Chair and assist with Neighborhood Chair responsibilities. The Chair and each Vice-Chair shall be a resident of the Neighborhood which they are elected to represent and shall be elected, in accordance with rules established by the Municipal Council Executive Director, by a majority of the adult residents of the Neighborhood who are present at the election meeting. Chairs are elected to serve approximately four (4) years. Vice-Chairs are elected for a period corresponding with that of the current Chair. If, for whatever reason, a Chair ceases to serve during that period, the current Vice-Chair(s) shall continue to serve until the election of a new Chair, at which point a new election shall also be held for the Vice-Chair positions. Newly elected Neighborhood Chairs shall be formally recognized at an ensuing Municipal Council meeting.

(b) Exceptions to Subsection (1)(a) of this Section shall be made in the Downtown, East Bay, and University Neighborhoods. In the East Bay Neighborhood, the East Bay Association shall appoint the Chair. In the University Neighborhood, the President of Brigham Young University is the Chair and may appoint one (1) or more Vice-Chairs as designated representatives. In the Downtown Neighborhood, there shall be two (2) Chairs: one (1) Chair shall be appointed by Downtown Provo, Inc., and one (1) Chair shall be elected by Neighborhood residents in accordance with Subsection (1)(a) of this Section. The Chairs of the Downtown Neighborhood shall each have all of the responsibilities and duties of a Neighborhood Chair described in this Chapter.

(c) Except for the Downtown and East Bay Neighborhoods, each Neighborhood, in a meeting held under the direction of the Municipal Council Executive Director, shall allow owners of the businesses located within the Neighborhood to elect a representative who shall serve as the Business Liaison to represent their interests at Neighborhood meetings and in presentations to the Municipal Council. Business Liaisons shall not be eligible to fill in for the Neighborhood Chair in matters representing the voice of the Neighborhood residents.

(d) Each Neighborhood Chair may appoint other residents of the Neighborhood to assist in the Chair's duties. The Neighborhood Chair, Vice-Chair(s), Business Liaisons, and the Neighborhood Chair's appointees shall constitute a Neighborhood Board. Each Neighborhood Board may establish its own bylaws to effectuate the orderly administration of its Neighborhood; provided, however, that the Neighborhood Chair and Vice-Chairs shall be elected as set forth in Subsection (1)(a) of this Section.

(e) The Neighborhood Chair may be removed from office according to the following procedure. A petition form may be obtained from the Municipal Council Executive Director, signed by representatives of at least fifty (50) households in the Neighborhood requesting the removal of the Neighborhood Chair, and submitted to the Executive Director. It shall then be the duty of the Executive Director to submit the question of removal to the residents of the Neighborhood at a Neighborhood Meeting convened for that purpose. No vote on the removal of a Neighborhood Chair shall be taken unless seventy-five percent (75%) of those who signed the petition are present in person at the meeting. No Neighborhood Chair shall be removed unless two-thirds (2/

3) of the residents of the Neighborhood who are present in person at the meeting shall vote in favor of such removal. A petition for removal of the Neighborhood Chair shall not be submitted until six (6) months after the Chair was elected. A petition for removal may not be submitted more than twice during a Neighborhood Chair's current term.

(f) The Municipal Council Executive Director shall notify the Municipal Council in writing when a Neighborhood Chair is no longer actively performing the duties of a Chair. If the Executive Director has not been able to resolve the situation within two (2) weeks of the time such notice was given, the Council may give written notice to the Executive Director that a new election meeting for Neighborhood Chair shall be held.

(2) *Neighborhood Area Council.* Each Neighborhood Area Council shall be guided by the provisions of this Subsection.

(a) Each Neighborhood Chair shall serve as the Neighborhood's representative to the Neighborhood Area Council. Each Chair shall designate a Vice-Chair to serve in their absence at Neighborhood Area Council meetings.

(b) Each Neighborhood Area Council shall elect from its members one (1) Chair or Vice-Chair to serve as the Area Representative and one (1) Chair or Vice-Chair to serve as the Assistant Area Representative; provided, that a Vice-Chair may not be elected to serve as an Area Representative or Assistant Area Representative without the approval of that Vice-Chair's Neighborhood Chair. The Assistant Area Representative, or a designated Neighborhood Chair from the area, may serve in the absence of the Area Representative on the Neighborhood Advisory Board.

(c) Area Representatives and Assistant Area Representatives shall be elected by a majority of Neighborhood Chairs within that Area who are present in person at the Neighborhood Chair Seminar at which the election meeting is held each year. A Neighborhood Chair may designate a Vice-Chair to attend the election and vote in his or her place. A special election meeting shall be convened by the Municipal Council Executive Director to fill any vacancy that may arise in Area Representative or Assistant Area Representative positions.

(d) Neighborhood Area Councils may alter Neighborhood boundaries within its Area by a unanimous vote of its members if such alteration is subsequently approved by the Municipal Council.

(3) *Neighborhood Advisory Board.* The Neighborhood Advisory Board shall be guided by the provisions of this Subsection.

(a) The Neighborhood Advisory Board shall meet at such times as the Advisory Board or Municipal Council deems necessary. Minutes of this meeting shall be distributed to all Neighborhood Chairs and Municipal Council members.

(b) A quorum of the Neighborhood Advisory Board must be present before the Board may vote on any issue. Motions by Board members shall be passed by majority vote of those Board members present in person at the meeting. Assistant Area Representatives and Neighborhood Chairs may attend, but only Area Representatives shall vote, except when an Assistant Area Representative or other designated Neighborhood Chair has been requested to attend in the absence of the Area Representative.

(Rep&ReEn 2000-34, Am 2004-38, Am 2006-45, Am 2006-53, Am 2007-16, Am 2010-09, Am 2012-24, Am 2015-47, Am 2017-55, Am 2018-15, Am 2019-03, Am 2020-63)

2.29.040 Neighborhood Meetings.

(1) *Local Issue Meetings.* A Neighborhood Chair may call a neighborhood meeting at any time to discuss issues of concern to residents of the neighborhood.

(2) *Development Proposal Meetings.*

(a) Within five (5) calendar days after receiving a complete land use application for any matter subject to a public hearing, the Community and Neighborhood Services or Development Services Departments shall mail notice of the application to the Neighborhood Chair of the neighborhood where the subject property is located. If the subject property is located within one thousand (1,000) feet from an adjoining neighborhood, the Community and Neighborhood Services or Development Services Departments shall also notify the Chair of that neighborhood.

(b) Within seven (7) calendar days after a land use application is deemed complete, the applicant shall contact the Neighborhood Chair of any neighborhood entitled to notice described in Subsection (2)(a) of this Section to discuss the application. The Neighborhood Chair must call for a neighborhood meeting to consider applications for a general plan amendment or zone change unless the application is filed by Provo City and has Citywide impact. For other application types, the Neighborhood Chair shall determine whether a neighborhood meeting should be held or waived.

(i) A neighborhood meeting held under this Section shall be scheduled for a date within forty-five (45) days of the sending of the notice described in Subsection (2)(a) of this Section.

(ii) Failure to hold a meeting required under this Subsection shall not invalidate consideration of an application by the Planning Commission or Municipal Council. (Related ordinances governing procedures of the Planning Commission are found in Sections 14.02.010 and 15.17.040, Provo City Code.)

(c) Where waiver of a neighborhood meeting is permitted under Subsection (2)(b) of this Section, the Chair shall notify the Municipal Council Executive Director in writing within fourteen (14) calendar days after the Community and Neighborhood Services or Development Services Departments mail notice of the application to a Neighborhood Chair that the neighborhood:

(i) Will organize a meeting to review and comment on the application; or

(ii) Waives the right to hold a neighborhood meeting.

(iii) If the Executive Director does not receive notice from the Neighborhood Chair in the period described above, the neighborhood meeting requirement shall be waived.

(d) A neighborhood meeting shall be held subject to the following procedures listed below:

(i) The meeting shall be called and organized by the Neighborhood Chair. The Neighborhood Chair shall set the agenda and conduct the meeting.

(ii) The meeting shall be scheduled for a date no later than forty-five (45) calendar days after the date when the Community and Neighborhood Services or Development Services Departments mail notice of the application to the Neighborhood Chair.

(iii) The meeting shall be held within the boundaries of the neighborhood or at another location as reasonably determined by the Neighborhood Chair.

(iv) The applicant shall bear the cost of printing and distributing information necessary for the meeting.

(v) At least seven (7) calendar days prior to the neighborhood meeting, the applicant shall provide notice of the meeting to the Council Office and all neighbors within one thousand (1,000) feet of the proposed development. Upon request of the Neighborhood Chair, notice shall be provided to the entire neighborhood area.

(vi) The Neighborhood Chair shall file a written report of the meeting with both the Council Office and the Community and Neighborhood Services or Development Services Departments within five (5) calendar days following the neighborhood meeting. Reports should include information on who was present at the meeting, a breakdown of the type of opinions/responses voiced at the meeting and received by the Chair outside of the meeting, and any specific concerns or recommendations.

(vii) If the Neighborhood Chair is unable to fulfill the foregoing responsibilities, the Chair may designate the Neighborhood Vice-Chair, the Neighborhood Area Council Representative, or an individual who resides within the neighborhood boundaries to carry out these responsibilities.

(Enacted 2006-53, Am 2015-47, Am 2016-20, Am 2018-23, Am 2020-57)

2.29.050 Matching Grant Review Process.

(1) The Municipal Council shall establish criteria for awarding matching grants and shall establish procedures for evaluating and approving grant applications.

(2) Municipal Council staff will review applications for completeness and submit complete applications to the Neighborhood Advisory Board. Office staff may provide observations and recommendations concerning applications.

(3) The Neighborhood Advisory Board will review, request additional information as needed, and recommend approval or rejection of the application.

(4) The Municipal Council Executive Director may accept or reject the Neighborhood Advisory Board's recommendation regarding any matching grant application, subject to direction by the Municipal Council Chair.

(Enacted 2017-55)

2.29.060 Neighborhood Chair Fee Waivers.

(1) A Neighborhood Chair may request a fee waiver before submitting an application to the Community and Neighborhood Services or Development Services Departments for:

(a) A text amendment to the General Plan or Title 14 or 15, Provo City Code; or

(b) A map amendment to the General Plan Map or the Zone Map of Provo.

(2) A Neighborhood Chair may only submit a fee waiver request if:

(a) The Chair first holds a neighborhood meeting at which a simple majority of those neighborhood residents present vote in support of the proposed amendment;

(b) The Chair is not the developer, or the agent of a developer, of a project related to the proposed amendment; and

(c) The Chair will not receive an economic benefit for advancing the proposed amendment or for any project related to the proposed amendment.

(3) The Neighborhood Advisory Board shall review the fee waiver request and make a recommendation for approval or denial of the request to the Community and Neighborhood Services or Development Services Director based on whether the Board believes the proposed amendment:

(a) Will benefit the entire City; or

(b) Will benefit the neighborhood of the submitting Chair and will not be a detriment to other areas of the City.

(4) The Community and Neighborhood Services or Development Services Director, or the Director's designee, shall make the final determination on the fee waiver request at the Director's, or designee's, discretion.

(Enacted 2019-03, Am 2020-57)

The Provo City Code is current through Ordinance 2021-17, passed April 20, 2021.

Disclaimer: The city recorder has the official version of the Provo City Code. Users should contact the city recorder for ordinances passed subsequent to the ordinance cited above.

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PROVO CITY MUNICIPAL COUNCIL

Staff Memorandum

John Magness, Policy Analyst

Neighborhood Councils and Provo's Neighborhood Program

June 15, 2021

Note: Academic literature on the subject uses the term "neighborhood councils" to refer to these community-based neighborhood organizations. Provo's Neighborhood Program has gone by different names at various times, including "Neighborhood Area Councils," but today is most commonly referred to as the "Neighborhood Program." Throughout this paper, the term "neighborhood council" is used to refer to these organizations generally (and for consistency with the literature and works cited) and "neighborhood program" is used to refer to Provo's version specifically.

Summary

The creation of Neighborhood Councils was born out of the Neo-liberal period of the late 1960s and early 70s. The idea behind the development was that it would increase the publics access to local government and help with the allocation of "Public Goods." The hope was that it would lead to greater accountability on the part of local government, coupled with increased citizen participation at the neighborhood level. The goal of the neighborhood councils was to act as a bridge between the citizens of the neighborhood and the municipal government and to act as a space where they could work together to address the needs of the neighborhood, plan for the future of both the city and neighborhood, and help deliver local services in an efficient manner. The reality is that neighborhood councils often fall short of these goals. The reasons are complex and there are not any simple solutions to correct the problems inherent to Neighborhood Councils.

Here are some of general attributes of functioning Neighborhood Councils:

1. Citywide system.
2. Adequate resources.
3. Political Support.
4. Empowerment.
5. Motivated leadership within the Neighborhood Council.

Below are the most salient problems with Neighborhood Councils:

1. Shortage of resources
    a. People (not enough of the residents of the neighborhood participate)

    b. City (the city does not supply enough time or personnel to ensure that NC function correctly)
    c. Funding
        i. Communications
        ii. Training
        iii. Neighborhood expenditures
2. Fiefdoms are created (those in charge of the NC use their position to achieve their own personal/political goals and not those of the neighborhood)
3. Segmentation (NC are concerned more about acquiring services and "public goods" for their neighborhood; neighborhoods looking inward and not outward)
4. Adversarial (NC leadership see themselves as protecting the neighborhood from the city administrator, creating an us-versus-them mentality)
5. Area Reps and Neighborhood Advisory Board are seen as ineffective and interfere with the proper function of NC and their relationship to the city.
6. Top-down versus bottom-up (the direction of control causes problems, with the NC leadership wanting a bottom-up approach and the city wanting a top-down approach)
7. Representation (less than 1% of the residents vote in NC leadership elections, so the question remains whether the NC leadership really represents the neighborhood)
8. *Prominenti* (the NC leadership is captured by a group of affluent people who only represent their equals to the detriment of the rest of the neighborhood members and the rest of the city)

The literature describes the deficiencies in Neighborhood Councils very thoroughly, yet gives little guidance on how to correct the problems. Most researchers agree that Neighborhood Councils are a worthwhile program and state the goal of acting as a bridge between the neighborhood and the municipality for the delivery of "public goods." Most agree that the Neighborhood Councils fall short of their goals because of the aforementioned reasons. One researcher argues that if the Neighborhood Councils were created to achieve certain goals and the program is not delivering on the stated goals, and instead is creating more problems, then the program should be abolished because it is ineffective and not achieving the intended goals.

This does not mean that all Neighborhood Councils are destined to fail—there are plenty of examples of functioning Neighborhood Councils. Neighborhood Councils can work; when they do not work as intended, it merits an assessment of the program, the problems with its function, and whether its stated goals or purpose are being met.

History

Neighborhood Councils are rooted in the Jeffersonian idea of Ward Republics. The idea is that local neighborhoods and their residents are more aware of their own needs than a centralized government. This was later built upon by Max Weber in his work *Economy and Society*. The idea discussed by Jefferson and Weber is that an individual's life revolves around their neighborhood—human activities, both social and economic, take place mainly in the neighborhood. These interactions between individuals at the neighborhood level are important to the neighborhood—because individuals that make up the neighborhood are aware of the local constraints and resources, they are better-suited to determine the proper course of action than a centralized government. This does not mean that a centralized government is not needed, but rather when making decisions, the centralized government needs to consider the needs and desires of the local neighborhoods.

The rise of Neighborhood Councils coincides with the decline of trust in government and general decline in political participations by citizens. In response, local governments created Neighborhood Councils to counter this distrust and in order to increase transparency and citizen involvement in the decision-making process in local government. The idea behind Neighborhood Councils is that they are sanctioned by local governments as a place where residents can go and participate in local government. It provides a forum for local residents to come together and discuss issues that are affecting their neighborhoods. The hope was that by creating Neighborhood Councils, citizens would participate more and have more trust in their local government.

The difference between Jefferson's and Weber's time and now is that an individual's life does not take place mainly in their neighborhood. They live in one neighborhood, work in another, and shop in yet another, so the idea of a small, complete neighborhood is now much larger to encompass the individual's social and economic life. The effect of globalization further expands an individual's horizons beyond that of a small, localized neighborhood.

Another reason for the Neighborhood Councils was to expand the structure of government by adding yet another layer or access point by which an individual can interact with government. When talking about governmental structure, there are two different elements: the structure of government, i.e., federal state and local; and how a branch of government is organized, i.e., the rules and laws that govern how it functions.

Both elements are important; the former creates the different access points and creates accountability by means of its role and responsibilities. The latter establishes the rules that government must abide by, which creates stability and legitimacy. By having strong governing structures citizens have greater faith in the agency because the interaction between the individual and the agency is the same for everyone. Organizations will also form to take advantage of the structure to advocate for their particular point of view.

Attributes

When looking at what makes a good Neighborhood Council, the literature list five attributes which are important to ensure a strong and functioning program:

1. Citywide system.
2. Adequate resources.
3. Political Support.
4. Empowerment.
5. Motivated leadership within the Neighborhood Council.

Citywide System refers to a Neighborhood Council that covers the entire jurisdiction. There are problems with Neighborhood Councils that only cover certain parts of the jurisdiction, as it creates an uneven allocation of resources and participation. There is research on the size and number of Neighborhood Councils in a jurisdiction. When discussing size, this refers to the number of residents living in each Neighborhood Council and the difference between the number of residents in the smallest district and the number of residents in the largest district. In the literature, the number of Neighborhood Council varies and it typically depends on the size of the jurisdiction. Smaller jurisdictions tend to have a limited number of around 5. Larger jurisdictions have many more, like Los Angeles, which currently has 99. The number of Neighborhood Councils influences the resources available to the program; the more districts, the more resources needed to ensure they function properly.

The size of each district does not seem to make a difference; there simply needs to be enough residents within the district to ensure enough active participation by the residents. A small number of residents within the Neighborhood Council district can lead it to be captured by a small but active group that may not truly reflect the majority opinion of the neighborhood. If the district is too large, then smaller groups within the neighborhood may be pushed aside and not be heard.

The allocation of resources can determine the effectiveness of a Neighborhood Council. Resources can be broken down into three different areas: monetary, staff, and time. Monetary support means the jurisdiction is investing enough money into the program to achieve the stated goals of the program. Monetary resources vary between jurisdictions because the stated goals from one Neighborhood Council from one jurisdiction can be vastly different from another jurisdiction based on goals and the responsibilities assigned to the Neighborhood Council.

Staff as a resource means how many staff are assigned to the program to ensure that it is meeting its stated goals and responsibilities. For some jurisdictions, the number of staff involved is as low as one staff person working to ensure that the program is functioning and that the Neighborhood Councils are functioning as the jurisdiction intended. Other jurisdictions assign staff to each neighborhood council to meet the day-to-day operations of the neighborhood council. Since Neighborhood Councils are enacted by the jurisdiction, it is the jurisdiction's responsibility to supply adequate staffing to ensure the program functions in a manner to achieve its stated goals.

Time is another resource that needs to be accounted for. Jurisdictions need to be aware of how much time they ask or require of the members of the Neighborhood Council board. Since these board members serve on a voluntary basis, as more time is required to complete the work of the Neighborhood Council, the fewer the volunteers who will be willing to serve on the Board. Staff time is also included in this resource—outside of staff assigned to the program, other staff members of the jurisdiction are required to provide information and or presentations to the Neighborhood Councils. When staff is working on issues for the Neighborhood Councils it takes away their time on work the jurisdiction needs accomplished.

Political support is important for Neighborhood Councils to function. Political support in this context means whether the elected officials of the jurisdiction support the program or are they adversarial to it. If there is no or limited political support for the program, then at best, the Neighborhood Council Board may take on an adversarial role towards elected officials and possibly even city staff. At its worst, participation by residents and board members may diminish to the point that the program no longer functions. Political support gives the program legitimacy, which in turn creates stronger involvement by residents.

Political support does not only refer to the elected officials' public support of the program, but also includes the elected officials' active involvement in the program to a degree. This could mean talking with board members when they reach out or actively going to meetings. If the elected officials do not support the program, there is no reason the residents will either.

Empowerment is a difficult resource to manage but it has the potential to cause the most harm. Jurisdictions need to give the Neighborhood Councils enough power to speak and act on behalf of the neighborhood. This power gives them a sense they are working to accomplish the needs of the neighborhood and not just rubberstamping decisions made by the elected body. If they feel as though they have no power, then participation will diminish, and they will take on an adversarial role with the elected officials. Given too much power, they could interfere with the proper function of the local jurisdiction. This empowerment must be finely balanced between the desired goals of the program and the ability of the Neighborhood Council Board to achieve these goals and not cross into the elected officials' powers and responsibilities.

Motivated leadership within the Neighborhood Council is important because the Neighborhood Council Board will require individuals with skill sets that will help the board function in a productive manner. Board members need to be effective leaders to ensure that neighborhood concerns— both the majority point of view but also the minority point of view—are articulated to the elected officials. They need to be skilled at dealing with conflict management when opposing viewpoints arise at meetings. They also need to have buy-in for the program; if they do not support the program, then there is a chance they will work at cross purposes of the stated goal of the program. Some of the literature suggest that board members need relationships within the neighborhood as well as outside the neighborhood to bring needed resources to the Neighborhood Council.

Each of these elements, as outlined on pages 1-2, can be linked back to one of the 5 attributes discussed. If one or more attributes are lacking, problems similar to these generally arise. Since the Neighborhood Council is a city-initiated program, it is the city's responsibility to address the problems.

Provo Neighborhood Program

I discussed these problems with Karen Tapahe, Community Relations Coordinator, who oversees the program Provo's Neighborhood Program. Provo's Neighborhood Program

suffers from all these problems in one form or another. Not all Neighborhood Councils have the same problem as others, but each have their own issues.

Turning our attention to Provo City Neighborhood Program, the program began in 1973, with neighborhoods that were created in 1968 during Provo's first General Plan. These neighborhoods were drawn around The Church of Christ Latter-Day Saints ward boundaries with 24 neighborhoods. This was done during the same period that saw trust in government and participation by citizens falling. A conscious attempt was made to provide minimal structure to the neighborhoods; each was left to organize themselves, in order to allow the greatest flexibility.

This creates its own problems as mentioned before—for governmental structures, the rules that govern how it functions create stability and legitimacy. While flexibility is desirable, the ability of the citizens to go from one neighborhood to the next and have a degree of consistency gives the program legitimacy. Having 34 neighborhoods with 34 sets of different rules causes confusion within the program. This causes the program to be at cross purposes with itself—on the one hand it is creating flexibility for each neighborhood to operate in a manner to meet their own needs, but these inconsistencies do not create the same access, opportunity, and accountability for residents involved with the Neighborhood Program.

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PROVO CITY MUNICIPAL COUNCIL

Staff Memorandum

Karen Tapahe, Community
Relations Coordinator

Provo City's Neighborhood Program

July 1, 2021

Background

Provo City's Neighborhood Program was created in 1968 by the City Commission in order to give input on the City's General Plan. It took a few years to get formalized, with 19-20 neighborhoods created and the Neighborhood Chairs appointed by the City. Adjustments were made to neighborhood boundaries as Provo grew and there are now 34 official neighborhoods. Neighborhood Chairs are elected by neighborhood residents and serve four-year terms.

Individual neighborhoods are grouped into Area Councils, with an Area Representative selected for each on an annual basis. The five Area Councils are useful for providing mentorship for new Chairs, identifying shared issues, and sending and gathering information. Neighborhood Chair/Vice Chair and Area Representative/Assistant Representative are all volunteer positions.

The program also includes a provision for matching grants. Neighborhoods can apply for funds for projects that improve the community, provided they are committed to matching those funds with volunteer labor or donations. Projects have included painting murals, installing sidewalks, placemaking signs, playground equipment, clearing trails, planting trees, revitalizing parks, and more. The funds are often maximized by working with City departments on projects of mutual interest.

The Neighborhood Program is under the direction of the Municipal Council and is incorporated into the City Code under Chapter 2.29. Staff, under the direction of the Council's Executive Director, manage the program and coordinate with Neighborhood Chairs. Most program activities are coordinated by the Community Relations Coordinator and the matching grants program is managed by the Council's Executive Office Assistant. A Neighborhood Advisory Board comprised of Councilors and Area Representatives was created to manage some review functions for the program and make recommendations.

To ensure the usefulness of the program, it is wise to regularly review it and make adjustments as needed. Provo's population continues to grow. We have new technological resources available for reaching out to the public, while other communication methods are fading away. To determine where we currently stand, Council staff conducted a survey on Open City Hall to gather input on the Neighborhood Program. 391 responses (153 registered, 238 unregistered) were received over a period of three weeks. The survey and complete results can be found online: https://www.opentownhall.com/portals/258/Issue_10700/survey_responses?scope=all

After nearly seven years of coordinating the Neighborhood Program, I have gathered information from surveys, spoken to past and present neighborhood leaders, and looked into similar programs in other cities to develop a list of concerns, recommendations, and suggestions.

Because each Councilor has had different experiences with and understanding of the program, it would be helpful to get direction from the Council as a whole before bringing any proposed changes to the Neighborhood Advisory Board for discussion. Another option would be to form a separate committee to review the program and return to the Council with recommendations.

Program Concerns

- Residents don't know about the Neighborhood Program
- Residents don't know that neighborhood meetings are being held
- Challenges in finding meeting locations
- Low attendance/participation at neighborhood meetings
- Too many neighborhoods to manage effectively
- Inconsistency in gathering neighborhood feedback
- Inconsistency in how zone change applications are reviewed in the required neighborhood meetings
- Neighborhood Chairs want more interaction with and direction from the Council
- Difficulty in getting people to volunteer to be Neighborhood Chair in some neighborhoods while other neighborhoods end up with contentious elections
- Virtual meetings and in-person meetings bring in different sets of attendees
- Confusion on what the role of the Neighborhood Chair is and what the goal of the program is

Next Steps

- Decide whether to send this discussion to the Neighborhood Advisory Board or to create a separate review committee
- Give direction on
    - Neighborhood Program goal (purpose)
    - Role of the Neighborhood Chair
    - Management of the Neighborhood Program

PROVO CITY MUNICIPAL COUNCIL

Staff Memorandum

John Magness, Policy Analyst

Provo's Neighborhood Program Open City Hall Responses (Citizens Responses)

June 15, 2021

I want to start by saying this is not a scientific poll and no attempt to correct for errors was made. There was a total of 391 responses to the Open City Hall questionnaire, of that there were 153 registered responses and 238 unregistered responses. The respondents are weighted towards longtime residents (57% have lived in Provo for more than 20 years) who own their own homes, we base this on the question on how the respondent has lived in their current home. Since renters tend to move with more frequency than homeowners by using how long they have lived current residence we see that 36.2% have lived in the current residence for more than 20 years and another 23.1% have lived at their current residence for 11 to 20 years. There is also an oversampling of older respondents, 71% are 45 or older.

Communication

The communication between residents and the city appears to be a two-way street over 60% of respondents receive information regarding the city from either the Neighborhood Chair, utility inserts, or Provo City email / newsletter. While over 70% of respondents like to communicate with the city either through the neighborhood chair or online communications. This shows that the respondents make good use of the lines of communication to receive information form the city as well as give feedback to the city.

We see that 63% of respondents receive information concerning their neighborhood from the neighborhood chairs while only 10% state they receive no information about their neighborhood. There appears to be a problem with getting information regarding neighborhood meetings and attendance a full 46% are not aware of meetings. While this number seems high it is not consistent with the other responses. 10% of respondents are very active while 22% are somewhat active. Another 38% attend infrequently while 29% do not attend meetings. When asked if they have ever been contacted by their neighborhood chair 73% of respondents answered yes. It appears that those who do not attend are attend infrequently do so because they are not aware of the meetings. Of note 10% of respondents are not interested in attending meetings.

Another note is that a full 30% of respondents only want the majority view from the neighborhood meeting conveyed to the council.

Meeting, Time, and Place

There is a dichotomy between the answers when asking this question. When asked if they would like to have a set date and time 61% of respondents answered in the affirmative while 17% had no opinion and 18% responded in the negative. While when asked how often neighborhoods should meet 20% responded as needed and another 28% answered that it should be up to the neighborhood. What I can deduce is that what residents want is the ability to know when a meeting is so if there are not contacted by the neighborhood chair they know by default when a meeting is happening, yet they only want to attend when an item is important to them.

Going thought he open ended comments one thing is clear those who are contacted and participate at regular intervals are happy with the program. While those who are not receiving information are not happy with the program and are supportive of changes to better enable them to participate. There is a small segment that feels marginalized by the program either because they are not contacted or their opinions are not communicated to the council by the neighborhood chair.

PROVO CITY MUNICIPAL COUNCIL

Staff Memorandum

John Magness, Policy Analyst

Neighborhood Councils and Provo's Neighborhood Program

June 15, 2021

Note: Academic literature on the subject uses the term "neighborhood councils" to refer to these community-based neighborhood organizations. Provo's Neighborhood Program has gone by different names at various times, including "Neighborhood Area Councils," but today is most commonly referred to as the "Neighborhood Program." Throughout this paper, the term "neighborhood council" is used to refer to these organizations generally (and for consistency with the literature and works cited) and "neighborhood program" is used to refer to Provo's version specifically.

Summary

The creation of Neighborhood Councils was born out of the Neo-liberal period of the late 1960s and early 70s. The idea behind the development was that it would increase the publics access to local government and help with the allocation of "Public Goods." The hope was that it would lead to greater accountability on the part of local government, coupled with increased citizen participation at the neighborhood level. The goal of the neighborhood councils was to act as a bridge between the citizens of the neighborhood and the municipal government and to act as a space where they could work together to address the needs of the neighborhood, plan for the future of both the city and neighborhood, and help deliver local services in an efficient manner. The reality is that neighborhood councils often fall short of these goals. The reasons are complex and there are not any simple solutions to correct the problems inherent to Neighborhood Councils.

Here are some of general attributes of functioning Neighborhood Councils:

1. Citywide system.
2. Adequate resources.
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Below are the most salient problems with Neighborhood Councils:

1. Shortage of resources
    a. People (not enough of the residents of the neighborhood participate)

    b. City (the city does not supply enough time or personnel to ensure that NC function correctly)
    c. Funding
        i. Communications
        ii. Training
        iii. Neighborhood expenditures
2. Fiefdoms are created (those in charge of the NC use their position to achieve their own personal/political goals and not those of the neighborhood)
3. Segmentation (NC are concerned more about acquiring services and "public goods" for their neighborhood; neighborhoods looking inward and not outward)
4. Adversarial (NC leadership see themselves as protecting the neighborhood from the city administrator, creating an us-versus-them mentality)
5. Area Reps and Neighborhood Advisory Board are seen as ineffective and interfere with the proper function of NC and their relationship to the city.
6. Top-down versus bottom-up (the direction of control causes problems, with the NC leadership wanting a bottom-up approach and the city wanting a top-down approach)
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PROVO CITY MUNICIPAL COUNCIL

Staff Memorandum

Karen Tapahe, Community Relations Coordinator

Provo City's Neighborhood Program

July 15, 2021

In the July 6 work meeting, staff shared research on neighborhood programs and organizations in general as well as survey results from Open City Hall. Here is additional information on the current Provo City Neighborhood Program:

- Neighborhood Handbook: https://sites.google.com/a/apps.provo.org/neighborhood-handbook/
- Neighborhood Program in Provo City Code: https://provo.municipal.codes/Code/2.29

The next step is for the Council to determine if the Neighborhood Program should be reviewed, discontinued, or continue as is. If the decision is to review the program, the next decision is to determine who should review it and what the scope of work should be as part of that review.

At the July 20 work meeting, staff will ask for a decision from the Council on reviewing, discontinuing, or continuing (as is) the Neighborhood Program. If the decision is to review, here are several options regarding who could conduct the review:

- Neighborhood Advisory Board (NAB) (consists of two Councilors and 5 Neighborhood Area Representatives)
- Form a new committee with just the Councilors currently on the NAB
- Form a new committee with Councilors not on the NAB
- Form a new committee with no Councilors (outside participation)
- Committee of the whole (all Councilors)

Regardless of which committee handles the review, they would be able to consult with City staff, community leaders, past and present Neighborhood Chairs, neighborhood organizations in other cities, and other subject matter experts.

To make the most out of the time provided for discussion at the next work meeting, we have provided a list of potential topics to be included in the scope of work. Including an item in the scope of work is simply a request for review and is not to be interpreted as a demand for changes. The Council Chair will review this list quickly, so be prepared to indicate whether the topic should be part of the scope of work.

- What should the committee include in the scope of work for their review?
  - Overall focus of the Neighborhood Program
  - Number of neighborhoods
  - Grouping of neighborhoods (Area structure)
  - Duties of Neighborhood Chair
  - Role of Neighborhood Vice Chair

- Electing versus appointing Neighborhood Chairs
- Enacting a Code of Ethics
- Training
- Reports at Council meetings
- Structure of neighborhood meeting reports
- Requirement to hold neighborhood meetings for certain types of land use applications
- Informing residents of meetings
- Managing neighborhood email lists
- Neighborhood visioning
- Matching grants program
- Staff management/coordination of Neighborhood Program

provo
NEIGHBORHOOD PROGRAM

34 PROVO NEIGHBORHOODS

EACH HAS A NEIGHBORHOOD CHAIR





CHAIR BRINGS INFORMATION BACK TO NEIGHBORHOOD RESIDENTS



COMMUNICATION BETWEEN PROVO CITY AND NEIGHBORHOOD CHAIR



NEIGHBORHOOD CHAIR REPRESENTS NEIGHBORHOOD AT PLANNING COMMISSION AND CITY COUNCIL MEETINGS





Provo City Land Use Application Process

Land use application filed with Community Development Department

within 5 days

Notice emailed to Neighborhood Chair

within 7 days

Developer contacts Neighborhood Chair

Neighborhood Chair determines whether or not a neighborhood meeting is needed

within 14 days

Neighborhood Chair informs Council office of decision about neighborhood meeting

Neighborhood Meeting

NO Neighborhood Meeting

Developer notifies neighbors within 1,000 feet of proposed development

Neighborhood meeting is held

Neighborhood Chair gathers input from neighbors - email, phone, meetings, etc.

Neighborhood Chair submits report to Council office, Community Development Department

Planning Commission hearing

Planning Commission gives recommendation of approval or denial and the application is sent to the City Council

Council work meeting

(next one after Planning Commission decision)

Council meeting

(same day as Council work meeting)

Council can:

-- Approve the application

-- Deny the application

-- Continue the item to be discussed again at the next Council meeting

Watch for this symbol to indicate where the public can comment or give input.

Plus you can always reach out to your Neighborhood Chair or Council members to share your thoughts.

PROVO MUNICIPAL COUNCIL STAFF REPORT

Submitter: MISANDERS
Department: Council
Requested Meeting Date: 07-20-2021

SUBJECT: A presentation on the Provo River Delta Restoration Project (21-083)

RECOMMENDATION: Presentation only

BACKGROUND: The Provo River Delta Restoration Project focuses on recovering the threatened June sucker and overall restoring the area's natural ecosystem. Furthermore, "improved recreation opportunities including trails, trailhead parking areas, restrooms, river access, fishing platforms, interpretive features, and a viewing tower" will be built.

The restoration began in 2020 and is anticipated to be completed in 2024.

This presentation will provide an update of what has been completed so far, describe ongoing operations, and outline the future phases at the restoration project.

FISCAL IMPACT: none

PRESENTER'S NAME: Melissa Stamp, Mitigation Commission

REQUESTED DURATION OF PRESENTATION: 30 minutes

COMPATIBILITY WITH GENERAL PLAN POLICIES, GOALS, AND OBJECTIVES:

CITYVIEW OR ISSUE FILE NUMBER: 21-083

Provo River Delta Restoration

Imagine What the Future Can Hold



Presentation to Provo City Council
July 20, 2021

PROVO RIVER DELTA

Melissa Stamp
Utah Reclamation Mitigation & Conservation Commission

Presentation Outline

- **Project Overview**
  - Features
  - Purpose
  - Schedule
- **Stakeholder Outreach & Coordination**
  - General
  - Provo City
- **Land Transactions with Provo**




PRDRP Project Area
Exisiting Recreation Features
Existing Trail To Be Removed
Existing Trail
Existing Trailhead
Proposed Recreation Features
New Trail
New Trailhead
Potential Fishing Access
Potential Non-Motorized Boat Launch
Potential Viewing Tower
Delta Features
Diversion
Small Dam
Inundated Area
New Provo River Course
Provo River Delta
Project Area
UTAH
LAKE
Skipper Bay Trailhead
Utah Lake
State Park
Boat Harbor Drive
Alligator Park Trailhead
Delta Gateway Trailhead
LAKEVIEW PARKWAY (PROVO CITY PROJECT)
Center Street

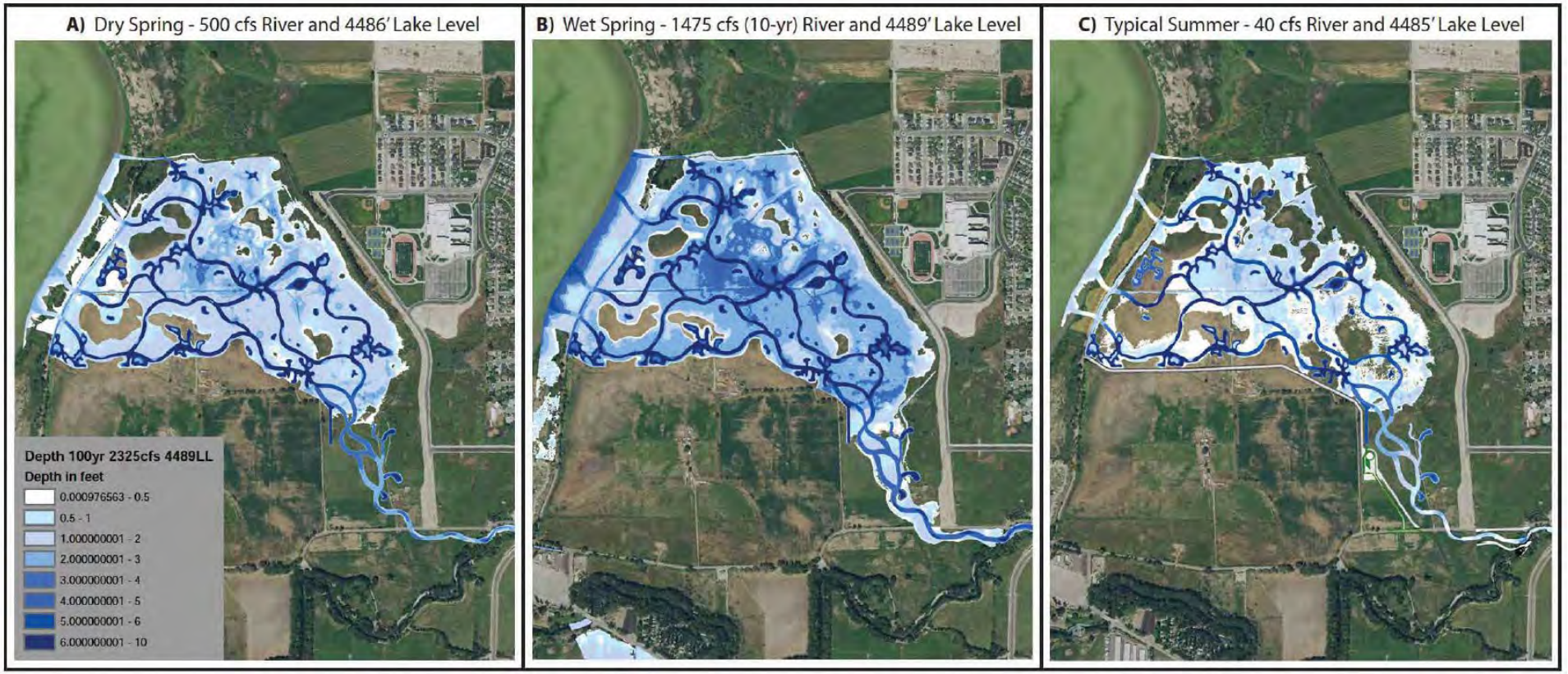
The Vision: Delta Area





Create nursery/rearing habitat

Delta Area Water Depths



- Most of delta area will be wet even during summer/low lake conditions
- Mostly emergent and rooted aquatic vegetation (bulrush, pondweed) with some pockets of riparian shrubs and trees
- Larval rearing habitat – cover, food

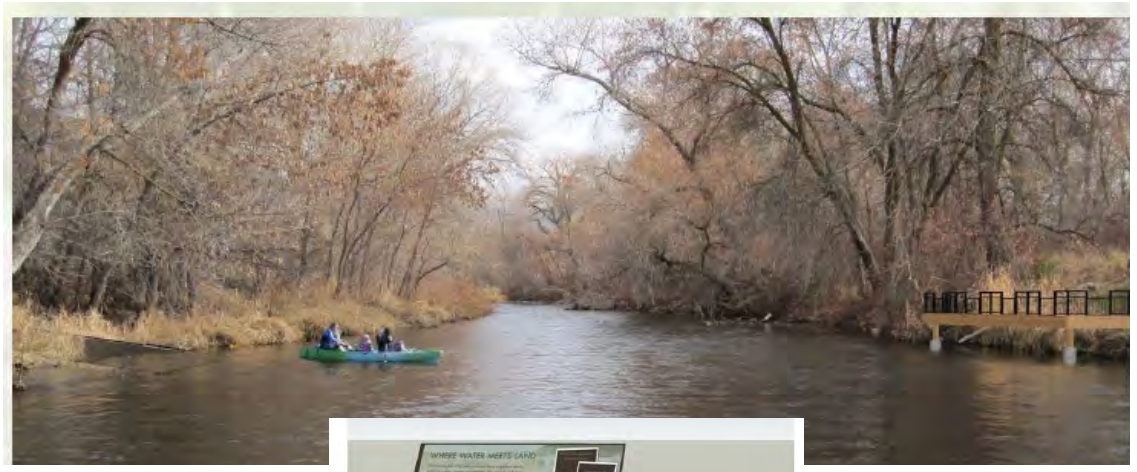
Recreation Features-Delta

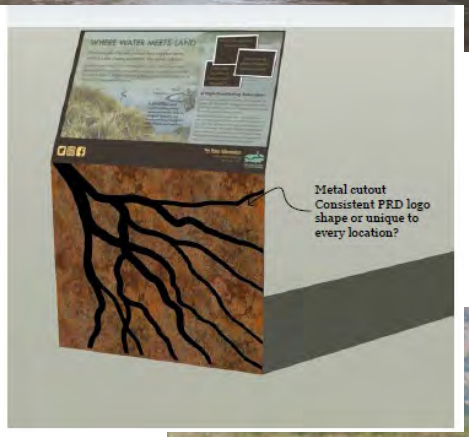
- Paved trail on berm
  - Equestrian trail
  - Loop opportunity
- Viewing tower
- Skipper Bay Trailhead
  - Parking
  - River Access



Recreation Features













Existing River Channel Features



Primary Objective

- Maintain/enhance existing character of area

Project Elements

- Flow delivery
- Small downstream dam
- Aeration
- Recreation Features



Recreation – Existing Channel

Existing Channel: Fishing Platforms & Non- Motorized Boat Access



Partnership With Provo City Parks & Recreation: Provo River Delta Gateway Park

- River Access
- Nature-themed Playground
- Interpretive Features
- Parking
- Restroom
- Other Amenities



Why Build a Delta?

Project is needed to facilitate June sucker recovery by restoring essential habitat conditions for spawning, hatching, larval transport, survival, rearing, and recruitment of June sucker on a self-sustaining basis.



Project Purposes

- Implement Recovery Plan criteria
- Provide compatible recreational improvements and opportunities
- Adopt flow regime targets and deliver supplemental water

- ***Multi-agency effort***

CENTRAL UTAH WATER CONSERVANCY DISTRICT

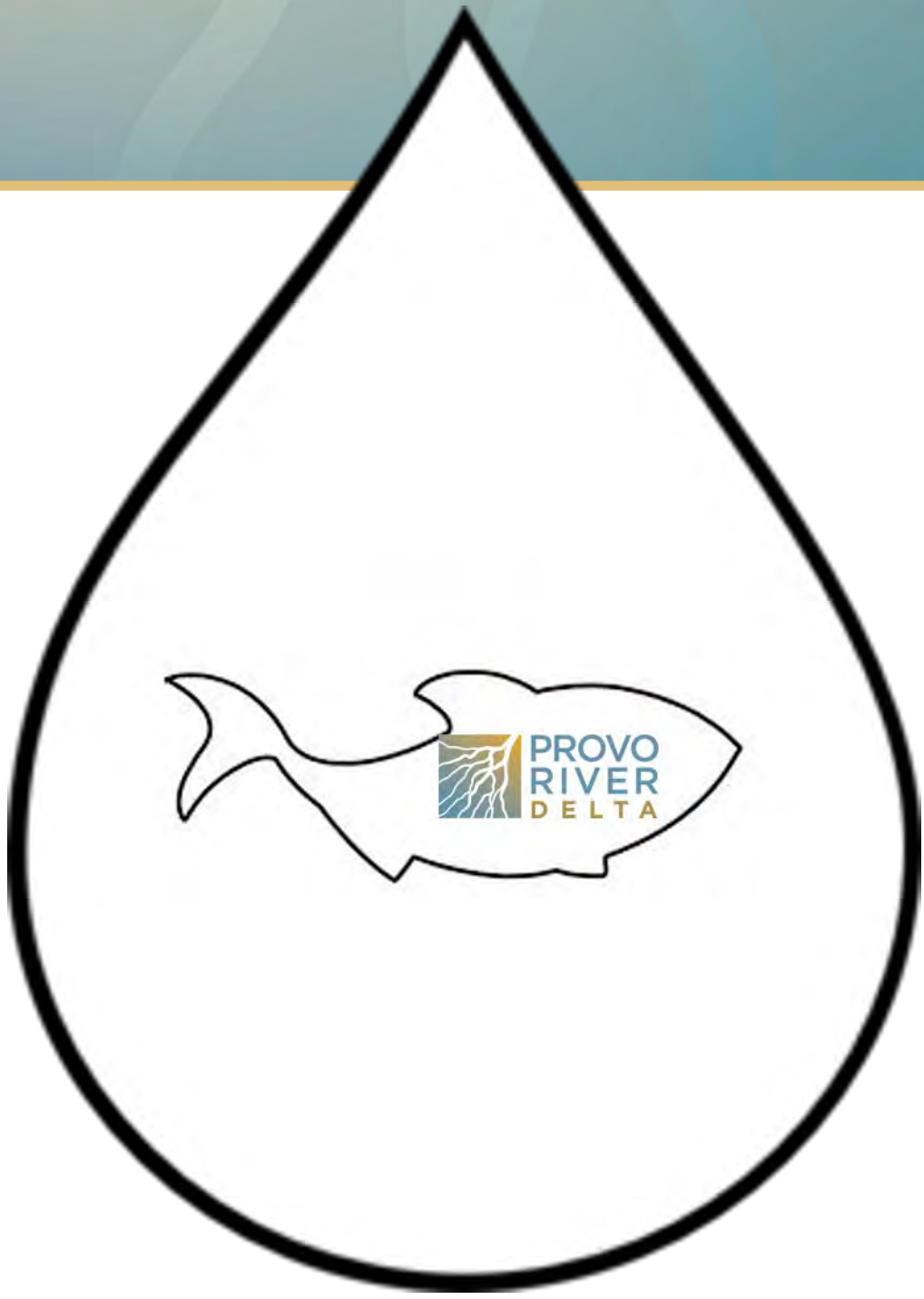
MITIGATION AND CONSERVATION COMMISSION

U.S. DEPARTMENT OF THE INTERIOR MARCH 3, 1849

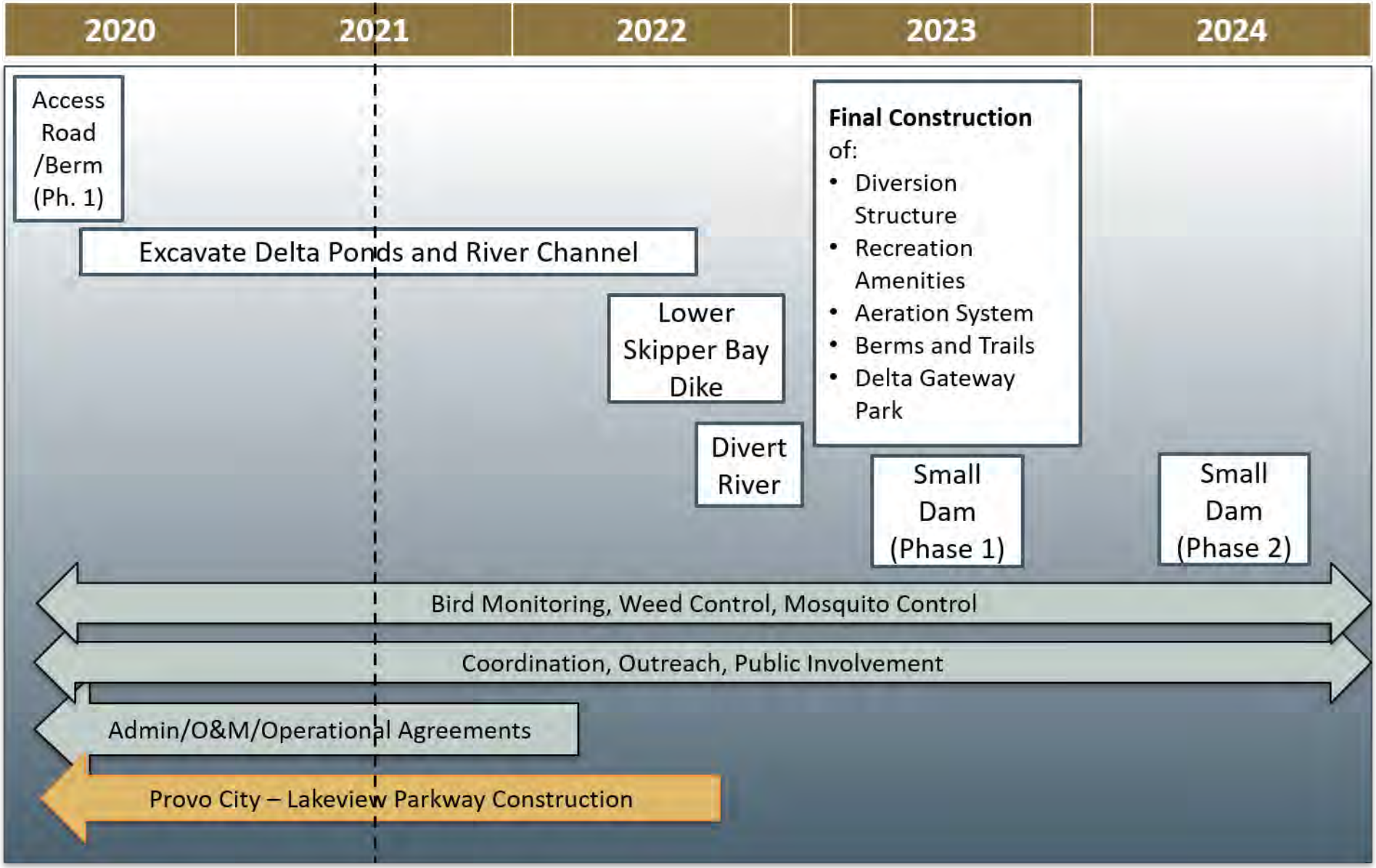
JUNE SUCKER RECOVERY IMPLEMENTATION PROGRAM

Why Build a Delta?

- Connection to water supply
  - Continued development and ongoing operation of Bonneville Unit water supplies is dependent on "sufficient progress" being made with June sucker recovery.



Construction Schedule

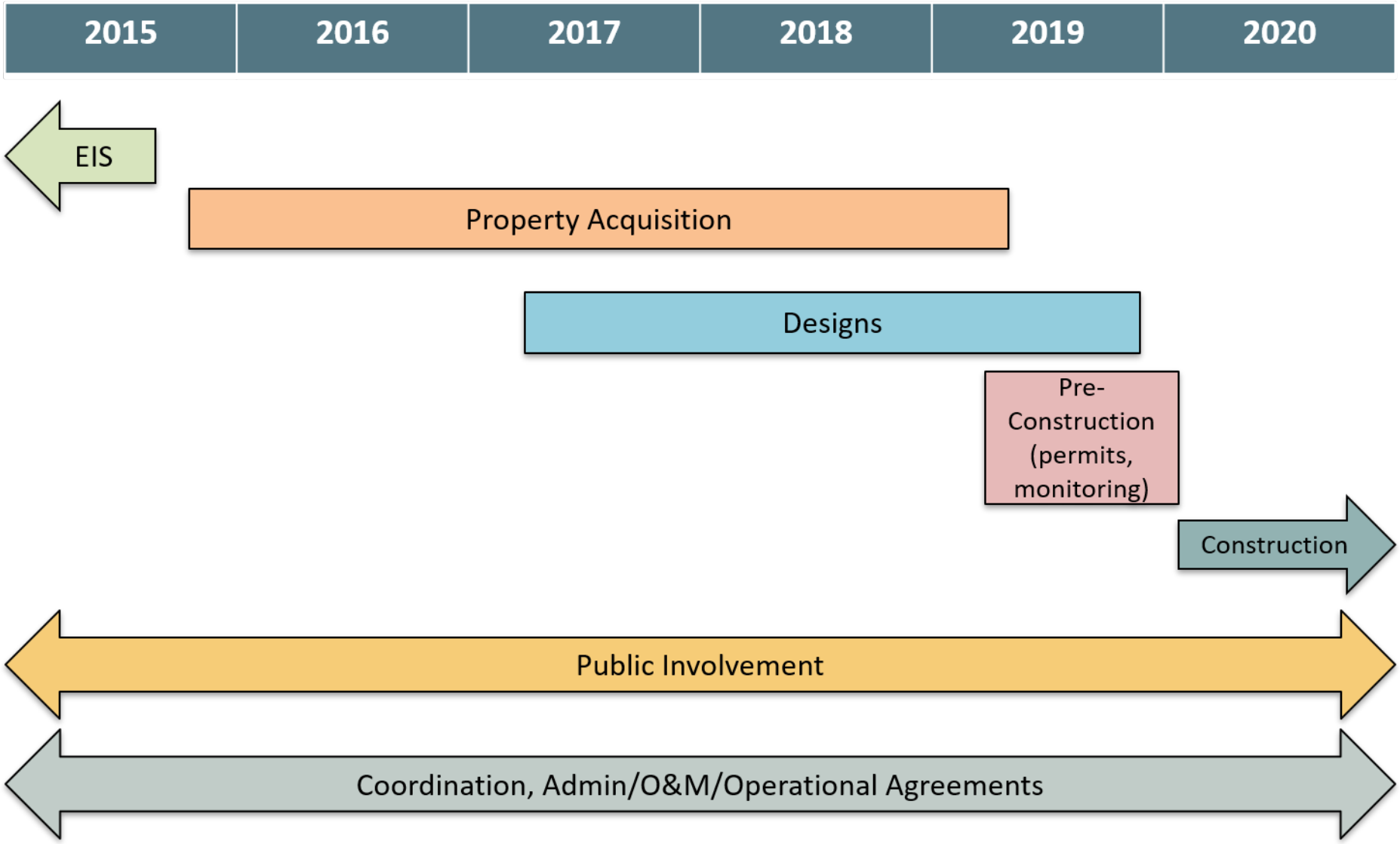


Presentation Outline

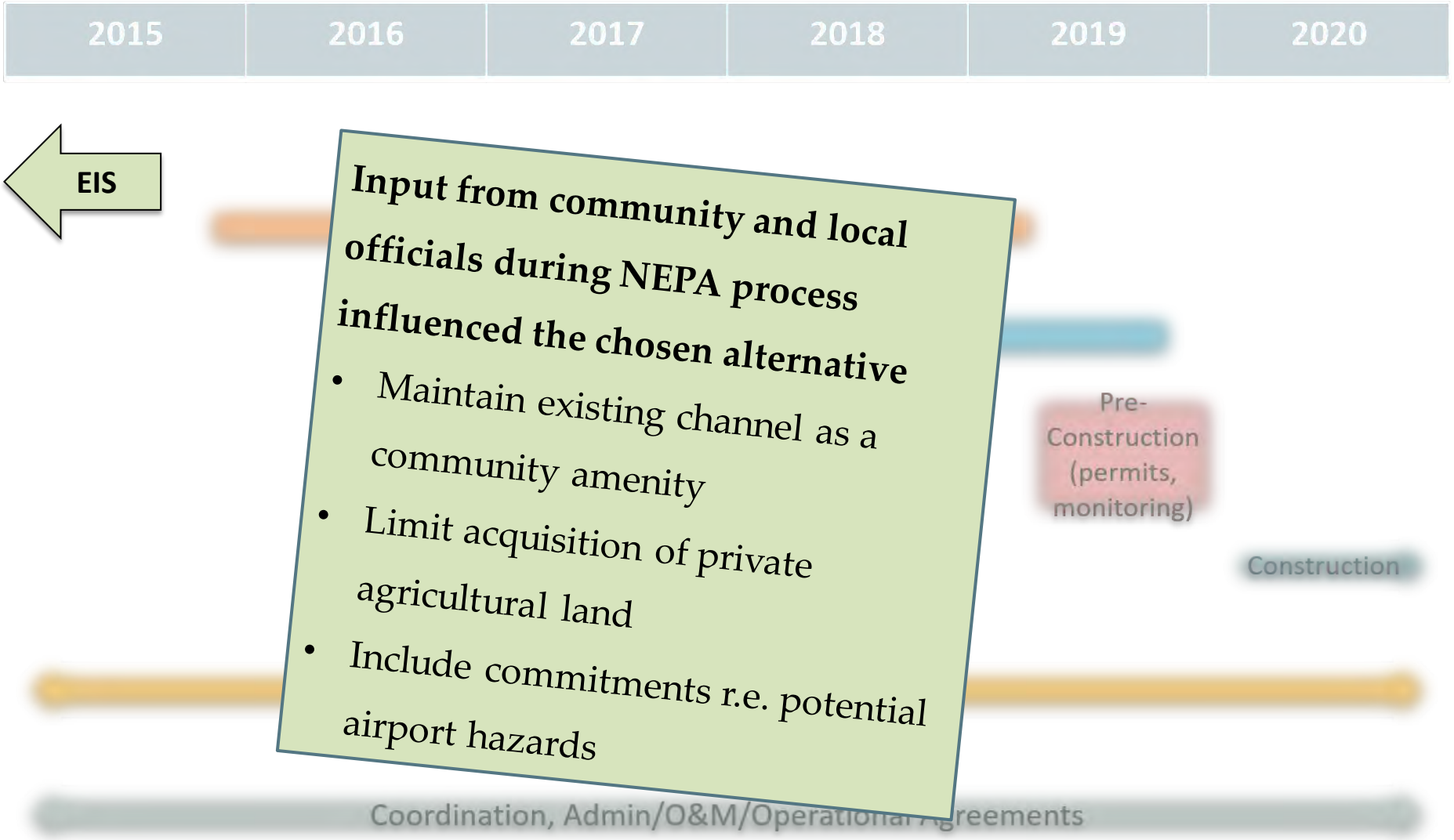
- **Project Overview**
  - Features
  - Purpose
  - Schedule
- **Stakeholder Outreach & Coordination**
  - General
  - Provo City
- **Land Transactions with Provo**



Project History



Project History



Input from community and local officials during NEPA process influenced the chosen alternative

- Maintain existing channel as a community amenity
- Limit acquisition of private agricultural land
- Include commitments r.e. potential airport hazards

Project History

2015	2016	2017	2018	2019	2020

Property Acquisition

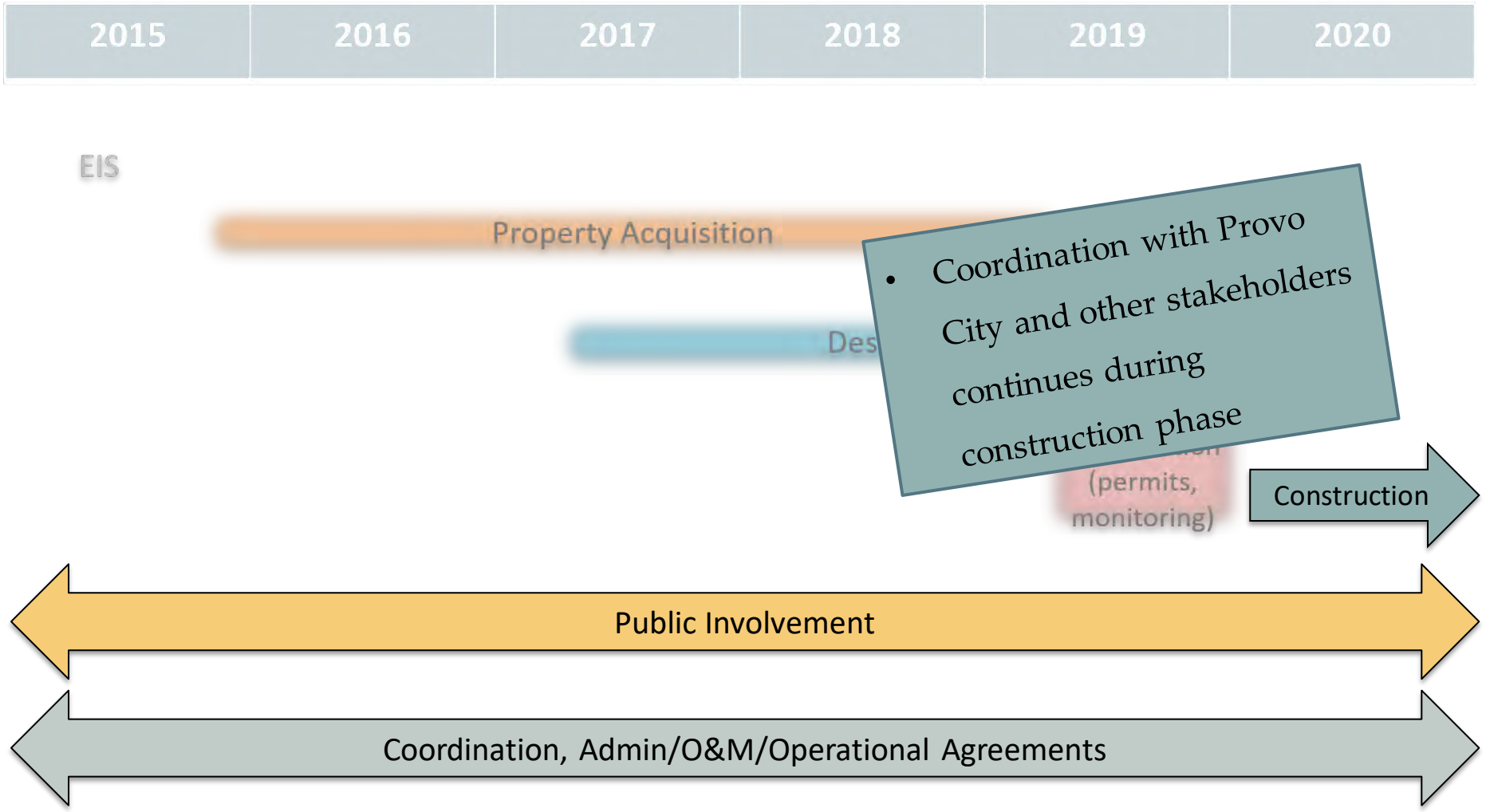
Designs

Pre-

Engagement with local stakeholders and concerns has informed designs

- Engagement with Provo airport, FAA, Wildlife Svcs to reduce bird strike risk
- Coordination with Utah County, Provo City, birders, anglers, boaters on recreation features
- Tweaks to acquisition boundary and trailhead location to accommodate neighboring landowner
- Coordination with Provo City on Lakeview Parkway

Project History



- Coordination with Provo City and other stakeholders continues during construction phase

Provo City Coordination

- Funding agreement for Lakeview Parkway design, construction
- Fill agreement – Provo Regional Sports Park – saves $$
- Funding agreement for Delta Gateway Park construction, land transfer
- Airport Hazard Mitigation Agreement, including funding for position at Provo airport
- Recreation workgroup participation
- Stewardship activity with Provo High School environmental science classes







Outreach

- Website
- Newsletters
- Utah Lake Commission
  - Fourth Grade field trips
  - Utah Lake Festival
  - Governing Board
- Provo High School
- Saturday Site Tours
- Angler Outreach







PRDRP Fulfills Multiple Objectives of Partners

- Utah Lake Master Plan (19 specific Objectives or Vision Statements)
- Concurrent Resolution HCR 26 supporting Utah Lake Restoration
- Utah Department of Natural Resources
  - Utah Division of Wildlife Resources
  - Utah Division of Parks and Recreation
  - Utah Division of Forestry, Fire and State Lands
- **Provo City *Provo Vision 2030* (8 Goals, 29 Objectives)**
- Utah County General Plan (8 Policies or Objectives)
- June Sucker Recovery Implementation Program

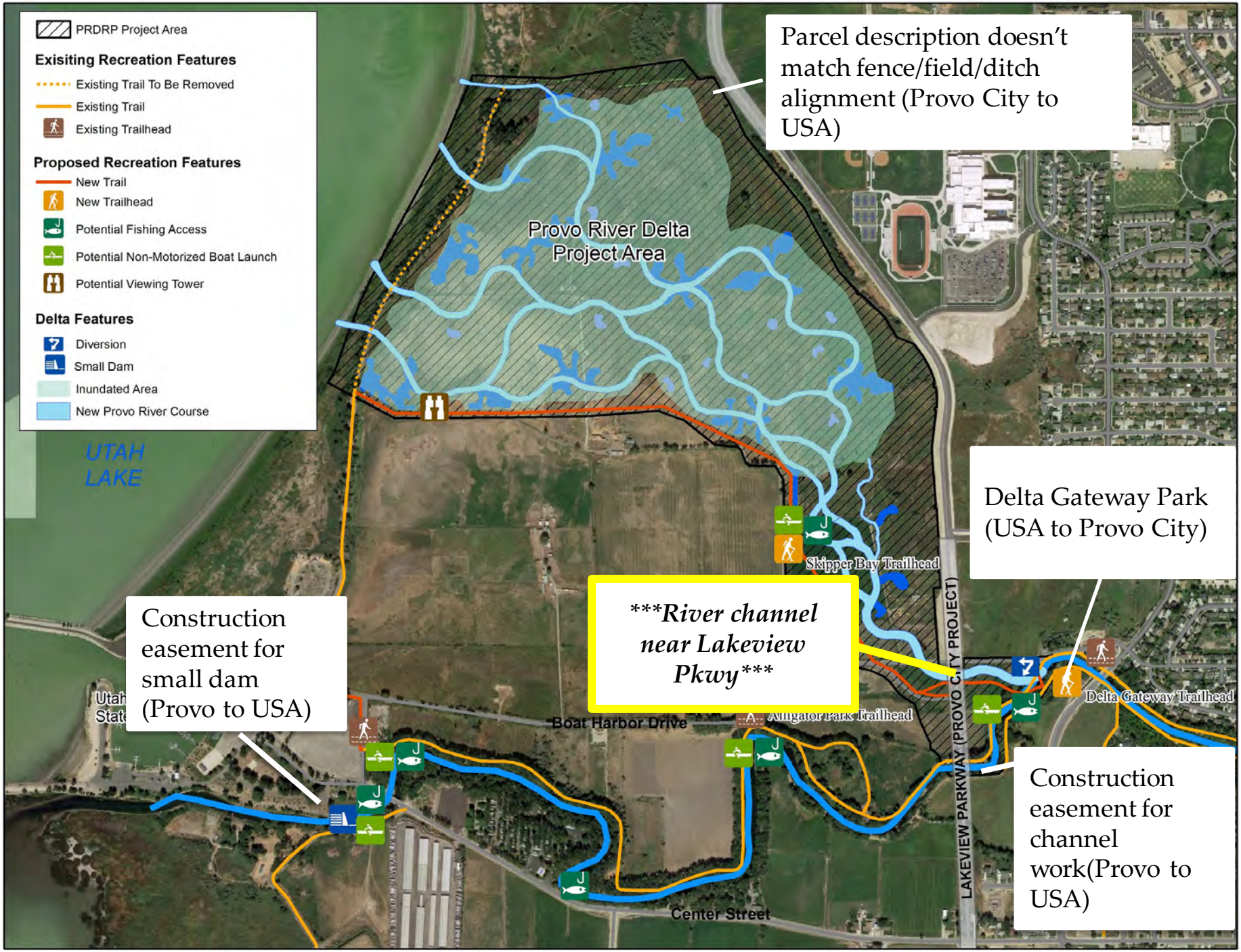
Presentation Outline

- **Project Overview**
  - Features
  - Purpose
  - Schedule

- **Stakeholder Outreach & Coordination**
  - General
  - Provo City

- **Land Transactions with Provo**
  - Several distinct areas
  - Priority is new river channel near Lakeview Pkwy




PRDRP Project Area
Exisiting Recreation Features
Existing Trail To Be Removed
Existing Trail
Existing Trailhead
Proposed Recreation Features
New Trail
New Trailhead
Potential Fishing Access
Potential Non-Motorized Boat Launch
Potential Viewing Tower
Delta Features
Diversion
Small Dam
Inundated Area
New Provo River Course
Parcel description doesn't match fence/field/ditch alignment (Provo City to USA)
Provo River Delta Project Area
UTAH LAKE
Delta Gateway Park (USA to Provo City)
Skipper Bay Trailhead
River channel near Lakeview Pkwy
Construction easement for small dam (Provo to USA)
Boat Harbor Drive
Alligator Park Trailhead
Delta Gateway Trailhead
LAKEVIEW PARKWAY (PROVO CITY PROJECT)
Construction easement for channel work(Provo to USA)
Center Street

Lakeview Pkwy Funding agreement

Agreement No. 17FC-UT-2190

AGREEMENT AMONG
PROVO CITY, a UTAH MUNICIPAL CORPORATION;
UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION;
THE U.S. DEPARTMENT OF THE INTERIOR –
CENTRAL UTAH PROJECT COMPLETION ACT OFFICE;
AND
CENTRAL UTAH WATER CONSERVANCY DISTRICT

COOPERATIVE PLANNING, DESIGN, CONSTRUCTION, AND FUNDING OF THE
PROVO LAKEVIEW PARKWAY AND TRAIL
AND THE
PROVO RIVER DELTA RESTORATION PROJECT,
CENTRAL UTAH PROJECT

I. AUTHORITY

This Agreement is made this 1st day of June, 2017, pursuant to the Central Utah Project Completion Act (Titles II through VI of Public Law 102-575, 106 Stat. 4605, October 30, 1992), as amended, hereinafter called the "CUPCA
MITIGATION AND CONSERVATION COMMI
Title III, Section 301(f)(4) of CUPCA, hereinafter
STATES DEPARTMENT OF THE INTERIOR -
ACT OFFICE, hereinafter called "Department"; th

WHEREAS, the PRDRP and the PLPT (including 620 North) share common areas of impact, and plans and designs for the PRDRP require alterations to the design of the PLPT, which will affect Provo's costs for design and construction of same; and

WHEREAS, the PRDRP and the PLPT (including 620 North) share common areas of impact, and plans and designs for the PLPT may require alterations to the design of the PRDRP, which will affect the United States' costs for design and construction of same; and

WHEREAS, the United States may require acquisition of land from Provo to implement the PRDRP, and Provo may need to acquire land from the United States for the PLPT; and

WHEREAS, coordination of sequencing, scheduling, and construction of the PRDRP and PLPT is in the best interests of all Parties; and

Agreement includes mechanism for compensation

2) Provo now owns land that may be desired by the Mitigation Commission for the PRDRP, and the Mitigation Commission expects to soon acquire land needed by Provo for its PLPT.
3) Provo and PRDRP are both continuing to work with property owners to acquire property for their respective projects.
4) The Parties will work together to accomplish any transactions needed to obtain ownership of the required parcels by each Party.
5) Transactions involving conveyance of land from the United States to Provo, will be executed only upon Provo's receipt of a Section 404 wetlands permit(s) from the US Army Corps of Engineers for the PLPT and 620 North Extension.
6) Each Party will follow applicable regulations and requirements to determine fair market values of the required parcels and work together through this Agreement to reconcile costs and, as permitted by law, make equitable compensation to the other Party as may be needed.
7) Where there is a transaction involving property disposition among Provo and the United States, any difference in land value may be factored into the net cost savings and/or cost increases determined as per Article V.2(e) herein, and, as permitted by law, may be used as partial compensation or credits.

Thank You!

- Visit our website
- Join us for a site tour
- Sign up to receive our newsletters
- Ask if you'd like us to present at a neighborhood meeting
- Get in touch if want to know more about JSRIP



PROVO RIVER DELTA

www.provoriverdelta.us

PROVO MUNICIPAL COUNCIL STAFF REPORT

Submitter: MISANDERS
Department: Council
Requested Meeting Date: 07-20-2021

SUBJECT: A presentation regarding the Development Process: "Context: How design, density, and aesthetics interact" (21-080)

RECOMMENDATION: Presentation only

BACKGROUND: The Council has indicated that it would like to receive presentations on a variety of development issues. Staff has invited speakers on a variety of topics relevant to community development.

The discussion today centers on the interconnection of design and density.

FISCAL IMPACT: none

PRESENTER'S NAME: Robert Mills, Planning Supervisor

REQUESTED DURATION OF PRESENTATION: 30 minutes

COMPATIBILITY WITH GENERAL PLAN POLICIES, GOALS, AND OBJECTIVES:

CITYVIEW OR ISSUE FILE NUMBER: 21-080