



**Powerline, Vineyard Road, Rittenhouse FRSs
Rehabilitation or Replacement Project
Work Assignment No. 3
FCD 2008C041**

**Initial Alternatives Stakeholder Workshop
Stakeholder Meeting No. 2
Minutes**

Location: Flood Control District of Maricopa County
Operations Conference Room

Date: September 13, 2010 (Monday)

Time: 8:00 am – 4:00 pm (8.0 hours)

Attendees:

<i>Ahouraiyan, Afshin</i>	<i>FCDMC</i>	<i>Leal, Bill</i>	<i>FCDMC</i>
<i>Ashbaugh, Travis</i>	<i>CAAG</i>	<i>Moodey, Lillian</i>	<i>Arizona State Land Department</i>
<i>Bansberg, Rich</i>	<i>AMEC</i>	<i>Moore, Elise</i>	<i>Pinal County Department of Public Works</i>
<i>Blake, Nicholas</i>	<i>City of Apache Junction</i>	<i>Park, Mike</i>	<i>EPG</i>
<i>De Simone, Dino</i>	<i>Natural Resources Conservation Service</i>	<i>Patel, Manny</i>	<i>Arizona State Land Department</i>
<i>DeCindis, Maureen</i>	<i>Maricopa Association of Governments</i>	<i>Perillo, Adam</i>	<i>KHA</i>
<i>Dovel, Chris</i>	<i>Town of Queen Creek</i>	<i>Rakestraw, Ken</i>	<i>FCDMC</i>
<i>Eichinger, Sarah</i>	<i>KHA</i>	<i>Regis, Tony</i>	<i>J2Engineering</i>
<i>Eichinger, Bob</i>	<i>KHA</i>	<i>Safi, Shahir</i>	<i>City of Mesa</i>
<i>Esquivias, Ruby</i>	<i>City of Apache Junction</i>	<i>Shapiro, Helen</i>	<i>Arizona State Land Department</i>
<i>Greenslade, Mike</i>	<i>FCDMC</i>	<i>Shildmyer, Joe</i>	<i>AECOM</i>
<i>Holcomb, Dennis</i>	<i>FCDMC</i>	<i>Smith, Heather</i>	<i>KHA</i>
<i>Hutchinson, Mike</i>	<i>Superstition Vistas</i>	<i>Smith, Sandie</i>	<i>Pinal Partnership</i>
<i>Jensen, Dave</i>	<i>KHA</i>	<i>Spence Gibson,</i>	<i>Arizona Department of Water Resources</i>
<i>Jones, Michael</i>	<i>FCDMC</i>	<i>Nicole</i>	<i>FCDMC</i>
<i>Kernan, Patrick</i>	<i>Central Arizona Project</i>	<i>Stevens, Bob</i>	<i>FCDMC</i>
<i>Klamut, John</i>	<i>KHA</i>	<i>Terry, Felicia</i>	<i>FCDMC</i>

The following meeting minutes set forth our understanding of the discussion and decisions made at this meeting. If you have any questions, additions or comments, please contact the writer immediately. If we do not hear from you within 5 business days of the submitted date, we will assume that our understandings are the same. We are proceeding based on the contents of these meeting notes.



Purpose: Initial Alternatives Formulation and Evaluation
Desired Outcome: 10 Alternatives for Further Consideration

Discussion Notes:

1. Welcome and Introductions

- a. Project team and stakeholder introductions.

2. Workshop Introduction (Felicia Terry)

- a. PVR structures were built by SCS (now NRCS) in the late 1960's. Structures were improved with central filters in 1991, 1983 and 1979. The Structures are located in Pinal County, but the Flood Control District of Maricopa County (FCDMC) is the local sponsor and operates and maintains the structures. Structures are located on AZ State Trust land on easements. The three dams total 11.6 miles in length and provide 12,600 acre feet of storage. The dams provide 100-year protection for 169 square miles of property. As of the 2000 census, 157,000 people were located downstream.
- b. The dams are hydraulically connected. The dams all drain to one outlet – the Powerline Floodway. Rittenhouse drains to Vineyard which drains to the Powerline Floodway. A downstream inundation area map was presented to illustrate properties affected by the dams.
- c. The project goals and objectives were discussed. The goals developed at the 1st stakeholders meeting were reviewed. A handout listing the goals was provided.
- d. An evaluation criteria was developed based on the goals discussed. The evaluation criteria includes the six items listed below:
 - 1.) Performance (Does it insure public safety? Does it offer the current level of flood protection?);
 - 2.) Risk (potential failure of the facility);
 - 3.) Environmental (mesquite bosque, wildlife);
 - 4.) Multi-use opportunities (recreational, landscape character);
 - 5.) Social (public acceptance, future land uses, future road crossings);
 - 6.) Economics (capital and O&M costs).



- e. The objectives of the workshop were presented. The objectives were to:
 - 1.) Obtain stakeholder input;
 - 2.) Formulate feasible alternatives;
 - 3.) Evaluate and rank the alternatives and reduce to ten.
- f. The workshop process was described in the following steps:
 - 1.) Present FRS issues and concerns;
 - 2.) Describe a toolbox of mitigation measures for the issues;
 - 3.) Brainstorm alternatives;
 - 4.) Breakout groups to score alternatives;
 - 5.) List scores of alternatives;
 - 6.) Identify the top 10 alternatives by score;
 - 7.) Discussion and consensus of top 10;
 - 8.) Provide a stakeholder survey.

3. Project Issues (Bob Eichinger)

- a. Several issues associated with the FRSs were presented. The current safety issues need to be taken into account when developing alternatives. The issues are summarized in the Existing Conditions Report, which was made available prior to the meeting. The issues identified include:
 - 1.) Potential for overtopping during large flood event (all structures overtop at flood event);
 - 2.) Embankment cracking (all);
 - 3.) Foundation deficiencies (all);
 - 4.) Central filters (all);
 - 5.) Outlet pipe deficiencies (seepage collars) (all);
 - 6.) Slow drain time for principal outlet (drains slower than criteria indicates) (all);
 - 7.) Potential auxiliary spillway erosion (potentially could erode during major flood event) (all);
 - 8.) Earth fissure: Powerline FRS (potential fissure);
 - 9.) Land subsidence: Powerline FRS, Vineyard Road FRS (north 1/3 of dam) (need to take into account the replacement of structures).
- b. The slow drain time of the principal outlet is not listed as a deficiency, it is a criteria. NRCS requires the pools be drained during the 100-year event in 10 days or less. The dams currently drain in approximately 12-18 days. Approach to NRCS is to discuss drain time. Faster drain times assist in flood protection and



- provide direct dam safety benefits. It was noted that a slower drain time increases groundwater recharge and could be viewed as a benefit. Slow drain time is also related to the downstream Powerline Floodway maximum capacity. The FCDMC is investigating the floodway capacity to determine if excess capacity is available. If the outflow from the dams is increased, the Powerline Floodway may also require improvements.
- c. It was noted that the FCDMC is currently in final planning stages of an Interim Dam Safety Measure (IDSM) for the Powerline FRS. The proposed IDSM alignment was presented.
 - d. Failure modes for the FRSs were discussed utilizing diagrams that show a typical section of the dams and potential flow paths for piping failures.
 - e. NRCS has several guidelines for evaluating alternatives. At a minimum the alternatives must include Rehabilitation, Decommissioning, and No Federal Action Alternatives. These categories were discussed and examples were provided.
 - f. Mitigation strategies were discussed. A toolbox handout was provided that described rehabilitation options for overtopping, auxiliary spillway erosion, slow flood pool drain, central filter issues, land subsidence, and earth fissure(s). It was noted that for the purpose of the workshop the details of the type of filter used for a rehabilitation alternative did not need to be identified.
 - g. The following additional comments regarding alternative options were discussed:
 - 1.) It was noted that there was FCDMC easement/property to the west of the dams associated with Siphon Draw that may provide an opportunity for alternatives;
 - 2.) It was noted that there was potential to possibly send additional flows south to Queen Creek instead of just to the Powerline Floodway;
 - 3.) There was concern that relocation of existing utilities that are placed in the existing spillway may be cost prohibitive for some alternatives. It was further noted by the team that federal guidelines indicate that all feasible alternatives shall be examined regardless of costs so utilities should not be a major concern for alternatives brainstorming.

4. Brainstorming Ideas for Alternatives

- a. The following Alternative Ideas were proposed by the group:
 - 1.) Incorporate future land use plan (i.e. Superstition Vistas);
 - 2.) Take water to Queen Creek Wash – utilize multi-use in the ideas;
 - 3.) Indian Bend Wash style corridor in place of dams;
 - 4.) Replace dams with eco-social friendly retention basins;
 - 5.) Eliminate southern spillway on Vineyard and connect to Rittenhouse to allow access (provide access corridor);



- 6.) Utilize excess land west of Rittenhouse within the modified easement area to create a larger structure, allowing the elimination of facilities to the north (possible basin/channel combination to the north);
- 7.) Leave Rittenhouse where it is, and add an additional basin to the west;
- 8.) Replace Powerline FRS with large basins and channels. Replace the north 1/3 of Vineyard with basins. Raise the remaining 2/3 of the Vineyard embankment. Rehabilitate Rittenhouse. At tail end, install gated drain pipe to Queen Creek.
- 9.) Offsite basins;
- 10.) Additional spillways or outlets that spread the water into natural flow paths;
- 11.) Rehabilitate Powerline interim measure – adjust to make it a 100-year project life solution. Raise Vineyard and Rittenhouse;
- 12.) Replace all central filters to the foundation level;
- 13.) Increase the capacity of inundation pools and lower emergency spillways to allow more flow regularly;
- 14.) Decommission the dams and restore original drainage channels;
- 15.) Add right-of-way and add dam upstream;
- 16.) Use a combination of rehabilitating existing dams at existing crest elevations with supplemental channels and basins;
- 17.) Replace earth fissure risk zone areas with channels and basins;
- 18.) Series of diversion structures to redirect flow to Queen Creek;
- 19.) Develop rough grading plans for common areas for developers to use fill material to assist with reducing footprint of structures, then rehabilitate structures;
- 20.) Work with ASLD Mine Leases to have sand and gravel mines excavate Queen Creek to provide flood storage volume – would need to divert watershed drainage to Queen Creek;
- 21.) Dam on Weekes Wash (offsite at northern end) (evaluate possible partners);
- 22.) Multi-use corridor on top of the dams;
- 23.) Array of recharge stations further upstream of the dams (outside the modified easement area);
- 24.) Replace Powerline FRS, eliminate Powerline Floodway, perform a minor rehabilitation of the dams, supplement all three with basins and re-route the flows south to Queen Creek;



- 25.) Replace existing Vineyard and Rittenhouse dams with a hardened structure in the center with an earthen blanket on either side that could be revegetated;
 - 26.) Recommendation to develop multi-use guidelines for the footprints;
 - 27.) Replace Powerline FRS with a 100-year channel to Vineyard, segment Vineyard into north ½ as dam, south ½ convert to a levee floodway to drain south to a basin that replaces Rittenhouse and discharges to Queen Creek; keep Powerline Floodway;
 - 28.) Replace both Powerline and Rittenhouse with 100-year channels; raise Vineyard Road to accept flows; discharge all to Powerline Floodway.
 - 29.) Multi-use lake (kayak run);
 - 30.) Create a larger basin to go outside the modified easement east of US 60 – replace with channel-basin system;
 - 31.) Channelize Powerline through a certain point in Vineyard, raise remaining portion of Vineyard, and rehabilitate Rittenhouse;
 - 32.) Optimize channels, basins, dams at least cost possible that meets project purposes;
 - 33.) Storm drainage requirements for future upstream developments be altered to reduce flow to dams;
 - 34.) Outflow into CAP;
 - 35.) Depending on north/south ADOT corridor being proposed (unidentified location), use embankment of roadway to act as a channel/basin/levee to divert flows into Queen Creek (roadway embankment would need to be FEMA certified);
 - 36.) FCDMC noted that the perhaps the existing structures should be rehabilitated for 100-year flood protection in a manner that can be incorporated into future development of the freeway system and allow for downsizing of the structures in the far future;
 - 37.) Leave all three dams in place – upgrade cut-offs, emergency spillways, and sizes as needed. Upgrade or rehabilitate all three dams;
 - 38.) Reduce the size of the existing structures to approximately five feet to protect the mesquite bosque, and install basins outside the mesquite bosque;
 - 39.) Decrease height, increase capacity, and increase floodway of Powerline;
 - 40.) Injection wells for recharge.
- b. The ideas above were combined or eliminated into specific topics for further evaluation. The refined alternatives descriptions are included in the attached Alternatives Summary Table.



5. Narrow List of Ideas of Alternatives

- a. Alternative Ideas were assigned to six table groups for discussion as follows:
 - 1.) Group 1 – Items 2, 3, 16, 31;
 - 2.) Group 2 – Items 6, 7, 17, 32;
 - 3.) Group 3 – Items 8, 19, 35;
 - 4.) Group 4 – Items 10, 11, 24, 37;
 - 5.) Group 5 – Items 13, 27, 38;
 - 6.) Group 6 – Items 9, 14, 28.

6. Group Evaluation

- a. Each group evaluated and ranked their assigned alternatives. See attached evaluation forms from Groups 1 – 6.

7. Identify Alternatives from Groups

- a. Alternative Ideas were ranked by Groups 1-6.
- b. Scores were tallied and ranked. See the attached Alternative Rankings Table for the scores.
- c. Entire group discussed and confirmed top 10 alternatives chosen to be evaluated.

8. Next Steps

- a. KHA to provide meeting minutes, Alternatives Summary Tables, alternative evaluation forms from the group evaluations, and diagrams to Stakeholders for resource information for survey completion.
- b. Stakeholders to complete the top four alternatives survey forms and return to project team by deadline (to be assigned when support information is provided by email).
- c. KHA to refine and evaluate top 10 alternatives identified.
- d. Field visit for stakeholders being scheduled to observe structures. Invitation will be emailed to stakeholders.

Powerline, Vineyard Road and Rittenhouse Flood Retarding Structures Rehabilitation or Replacement Project - Work Assignment #3

Alternatives Summary Table

Idea #	Alternative Ideas Selected for Further Consideration
2	Take water to Queen Creek Wash – utilize multi-use in the ideas.
3	Indian Bend Wash style corridor in place of the dams, series of diversion structures to redirect flow to Queen Creek. Replace dams with eco-social friendly retention basins. [Includes Alternatives #4 and #18]
6	Utilize excess land west of Rittenhouse FRS within modified easement area to create a larger structure to allow the elimination of facilities to the north (possible basin/channel combination to the north).
7	Leave Rittenhouse FRS where it is, and add an additional basin to the west.
8	Replace Powerline FRS with large basins and channels. Replace north 1/3 of Vineyard FRS with basins. Raise remaining 2/3 of Vineyard FRS. Rehabilitate Rittenhouse FRS; at tail end, install gated drain pipe to Queen Creek.
9	Offsite basins (downstream); dam on Weekes Wash (offsite at northern end) (evaluate possible partners). Array of recharge stations further upstream of the dam (outside the modified easement area); create a larger basin to go outside the modified easement east of US 60 – replace with channel-basin system; add right-of-way and add dam upstream. Storm drainage requirements for future upstream developments be altered to reduce flow to dams. [Includes Alternatives #15, #21, #23, #30, and #33]
10	Additional spillways or outlets that spread the water more into natural flow paths.
11	Rehabilitate Powerline FRS interim measure – adjust to make it a 100-year project life solution. Raise Vineyard FRS and Rittenhouse FRS.
14	Decommission the dams and restore original drainage channels.
16	Use a combination of rehabilitating existing dams at existing crest elevations with supplemental channels and basins.
24	Replace Powerline FRS, eliminate Powerline Floodway, perform a minor rehabilitation of the dams, supplement all three to re-route the flows south to Queen Creek.
27	Replace Powerline FRS with a 100-year channel to Vineyard FRS, segment Vineyard FRS into north ½ as dam, south ½ convert to a levee floodway to drain south to a basin that replaces Rittenhouse FRS and discharges to Queen Creek. Keep Powerline Floodway.
28	Replace both Powerline FRS and Rittenhouse FRS with 100-year channels; raise Vineyard Road FRS to accept flows; discharge all to Powerline Floodway.
31	Channelize Powerline FRS through a certain point in Vineyard FRS, raise remaining portion of Vineyard FRS, rehabilitate Rittenhouse FRS.
37	Leave all three dams in place – upgrade cut-offs, emergency spillways, and sizes as needed. Upgrade or rehabilitate all three dams.
38	Reduce the size of the existing structures to approximately six feet to protect mesquite bosque, and install basins outside the mesquite bosque. Decrease height, increase capacity, and increase floodway of Powerline FRS. [Includes Alternative #39]
Idea #	Alternative Ideas Classified as Design Standards
1	Incorporate future land useplan (i.e. Superstition Vistas).
5	Eliminate southern spillway on Vineyard FRS and connect to Rittenhouse FRS to allow access (provide access corridor).
10	Additional spillways or outlets that spread the water more into natural flow paths.
12	Replace all central filters to the foundation level.
13	Increase capacity of inundation pools and lower emergency spillways to allow more flow regularly.
17	Replace earth fissure risk zone areas with channels and basins (considered as a combination with 6a and 6b).
19	Develop rough grading plans for common areas for developers to use fill material to assist with reducing footprint of structures, then rehabilitate structures.
22	Multi-use corridor on top of the dam (include in footprint guidelines).
25	Replace existing Vineyard and Rittenhouse dams with a hardened structure in the center with an earthen blanket on either side that could be revegetated.
26	Recommendation to develop multi-use guidelines for the footprints.
29	Multi-use lake (kayak run).
32	Optimize channels, basins, dams at least cost possible that meets project purpose.
35	ASLD ideas to minimize footprint: depending on north/south ADOT corridor being proposed (unidentified location), use a channel adjacent and parallel to north/south corridor to flow into Queen Creek (roadway embankment would need to be a FEMA certified road). Future north/south freeway, US 60 bypass, and 802 used as levees.
36	FCDMC build structure for 100-year flood protection that can be incorporated into freeway system future development – sequencing with future transportation planning to allow for future downsizing of FCDMC facilities.
40	Injection wells for recharge.
Idea #	Alternative Ideas Eliminated from Consideration
20	Work with ASLD Mine Leases to have sand and gravel mines excavate Queen Creek to provide flood storage volume – would need to divert watershed drainage to Queen Creek.
34	Outflow into CAP.

Powerline, Vineyard Road and Rittenhouse Flood Retarding Structures Rehabilitation or Replacement Project - Work Assignment #3

Alternative Rankings Table

Group #	Idea #	Alternative Idea Description	Score	Ranking
4	37	Leave all three dams in place – upgrade cut-offs, emergency spillways, and sizes as needed. Upgrade or rehabilitate all three dams. [Merge with #11 Rehabilitate Powerline interim measure – adjust to make it a 100-year project life solution. Raise Vineyard and Rittenhouse]	28	1
1	2	Take water to Queen Creek Wash – utilize multi-use in the ideas.	24	2
5	38	Reduce the size of the existing structures to approximately six feet to protect mesquite bosque, and install basins outside the mesquite bosque; Decrease height, increase capacity, and increase floodway of Powerline FRS.	24	3
1	3b	Indian Bend Wash style corridor in place of dams; series of diversion structures to redirect flow to Queen Creek. Replace dams with eco-social friendly retention basins - 100-year basin.	22	4
1	16	Use a combination of rehabilitating existing dams at existing crest elevations with supplemental channels and basins.	22	5
2	6b	Utilize excess land west of Rittenhouse FRS within modified easement area to create a larger structure to allow the elimination of facilities to the north (possible basin/channel combination to the north) - Outlet to Powerline Floodway. [Add #17 to #6 - replace earth fissure risk zone areas with channels and basins]	22	6
2	6a	Utilize excess land west of Rittenhouse FRS within modified easement area to create a larger structure to allow the elimination of facilities to the north (possible basin/channel combination to the north) - Outlet to Queen Creek. [Add #17 to 6 - Replace earth fissure risk zone areas with channels and basins]	21	6
3	8	Replace Powerline FRS with large basins and channels. Replace north 1/3 of Vineyard FRS with basins. Raise remaining 2/3 of Vineyard FRS. Rehabilitate Rittenhouse FRS; at tail end, install gated drain pipe to Queen Creek.	21	7
5	27	Replace Powerline FRS with a 100-year channel to Vineyard FRS, segment Vineyard FRS into north ½ as dam, south ½ convert to a levee floodway to drain south to a basin that replaces Rittenhouse FRS and discharges to Queen Creek. Keep Powerline Floodway. [Team to revisit for best possible scenario]	20	8
6	9	Offsite basins (downstream); dam on Weekes Wash (offsite at northern end) (evaluate possible partners); array of recharge stations further upstream of the dam (outside the modified easement area). Create a larger basin to go outside the modified easement east of US 60 – replace with channel-basin system; add right-of-way and add dam upstream. Storm drainage requirements for future upstream developments be altered to reduce flow to dams. [Stakeholders to provide further information on top 4 survey for offsite alternative location, if an offsite alternative is preferred]	18	9
6	28	Replace both Powerline FRS and Rittenhouse FRS with 100-year channels; raise Vineyard Road FRS to accept flows; discharge all to Powerline Floodway.	18	10
1	3a	Indian Bend Wash style corridor in place of dams; series of diversion structures to redirect flow to Queen Creek. Replace dams with eco-social friendly retention basins - Channel.	17	11
1	31	Channelize Powerline FRS through a certain point in Vineyard FRS, raise remaining portion of Vineyard FRS, rehabilitate Rittenhouse FRS.	16	12
2	7	Leave Rittenhouse FRS where it is, and add an additional basin to the west.	15	13
4	24	Replace Powerline FRS, eliminate Powerline Floodway, perform a minor rehabilitation of the dams, supplement all three to re-route the flows south to Queen Creek (excavated channel to Queen Creek).	11	14
6	14	Decommission the dams and restore original drainage channels. [Must be evaluated for NRCs requirements]	10	15

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 1

Alternative: #2 - Take water to Queen Creek Wash – utilize multi-use in the ideas

Advantages:

- System Drawdown
- Possibly eliminate need to improve Powerline Floodway
- Possible recharge benefits to QC
- Could increase outlet size with cost share partners to discharge to QC
- Flexible to work with dams or basins
- Multi-use connection

Disadvantages:

- Outside of easement - additional cost of land
- Might need to operate gate manually
-
-

Comments:

Adds an outlet to Queen Creek to any alternative. Because we don't want to add flows to Q.C. peak, recommend a gated outlet so a flowage easement will not be needed along Q.C. Provide a multi-use connection between Q.C. and the FRS facilities. Also, suggest stream gages along Q.C. so we will know when to open the gate. Performance Score reflects open gate; Risk score reflects open gate; Environmental score reflects water behind dam.

Criteria	Score
Performance	4
Risk	3
Environmental	4
Multi-Use Opportunities	5
Social	4
Economic	4
TOTAL	24

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 1

Alternative: #3a - Indian Bend Wash style corridor in place of dams; Series of diversion structures to redirect flow to Queen Creek; Replace dams with eco-social friendly retention basins and Channels

Advantages:

- Large multi-use area
- Wildlife habitat
- Reduce dam height
-

Disadvantages:

- Increasing flow to Q.C.
- Might need flowage easement along Q.C.
- Take significant land
- Remove Bosques
- Very costly

Comments:

It would need to be a series of basins so additional flow into Q.C. would be reduced. Might need to buy flowage easements along Q.C. Need to re-delineate floodplain along Q.C. Storing all water in basins for 100-year before releasing, 3A - Channels, 3B - 100-year basins with levee.

Criteria	Score
Performance	4
Risk	3
Environmental	2
Multi-Use Opportunities	5
Social	2
Economic	1
TOTAL	17

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 1

Alternative: #3b - Indian Bend Wash style corridor in place of dams; Series of diversion structures to redirect flow to Queen Creek; Replace dams with eco-social friendly retention basins and 100-year Basins with Levee

Advantages:

- Large multi-use area
- Wildlife habitat
- Reduce dam height and make levees
-

Disadvantages:

- Increasing flow to Q.C.
- Might need flowage easement along Q.C.
- Take significant land
- Remove Bosques
- Very costly

Comments:

It would need to be a series of basins so additional flow into Q.C. would be reduced. Might need to buy flowage easements along Q.C. Need to re-delineate floodplain along Q.C. The dams would be lowered to act more like a levee. Storing all water in basins for 100-year before releasing, 3A - Channels, 3B - 100-year basins with levee.

Criteria	Score
Performance	4
Risk	4
Environmental	2
Multi-Use Opportunities	5
Social	5
Economic	2
TOTAL	22

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 2

Alternative: #6a - Utilize excess land west of Rittenhouse within Modified Easement area to create a larger structure to allow the elimination of facilities to the north (possible basin/channel combination to the north) - Outlet to Queen Creek

Advantages:

- Reduce flood pool area - move it west.
- Reduce inundation pool in fissure area by enlarging Rittenhouse pool.
- Takes advantage of area between CAP and Rittenhouse.
- Possible recharge at Rittenhouse.

Disadvantages:

- Political - need to drain to Queen Creek - maybe fatal flaw.
- Cost - rehab vs. replacement.
- Cost of additional outlet/NEPA process for outlet.
-

Comments:

This is option 6a that drains to Queen Creek. Team needs to evaluate feasibility of draining to Queen Creek. If this is feasible, then this alternative may be preferred over 6b. This alternative should be in used combination with basin/channel (Alt 17) to replace dams near fissure risk zone areas of Vineyard and Powerline.

Criteria	Score
Performance	5
Risk	4
Environmental	3
Multi-Use Opportunities	3
Social	3
Economic	3
TOTAL	21

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 2

Alternative: #6b - Utilize excess land west of Rittenhouse within Modified Easement area to create a larger structure to allow the elimination of facilities to the north (possible basin/channel combination to the north) - Outlet to Powerline Floodway

Advantages:

- Don't need to drain to Queen Creek.
- Take advantage of area between CAP and Rittenhouse.
- Reduce the inundation footprint (move it west).
-

Disadvantages:

- Cost - rehab vs. replacement.
- Diversion channels may be needed upstream near easement line to drain Vineyard Watershed into new, larger Rittenhouse dam (back and forth).
-
-

Comments:

This alternative should be in used combination with basin/channel (Alt 17) to replace dams near fissure risk zone areas of Vineyard and Powerline.

Criteria	Score
Performance	4
Risk	4
Environmental	4
Multi-Use Opportunities	3
Social	4
Economic	3
TOTAL	22

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 2

Alternative: #7 - Leave Rittenhouse where it is, and add an additional basin to the west.

Advantages:

- Reduce footprint to the east.
- Provide additional capacity for Vineyard flows.
-
-

Disadvantages:

- more dam penetrations to drain Rittenhouse to basin
- How does it drain to Queen Creek? Basin depth would be prohibitive. Would need outlet pipe under CAP.
- Cost vs. rehab.
-

Comments:

Criteria	Score
Performance	3
Risk	4
Environmental	2
Multi-Use Opportunities	2
Social	2
Economic	2
TOTAL	15

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 3

Alternative: #8 - Replace Powerline FRS with large basins and channels. Replace north 1/3 of Vineyard with basins. Raise remaining 2/3 of Vineyard. Rehab Rittenhouse. At tail end, install drain pipe gated to Queen Creek.

Advantages:

- Remove dam failure risk at Powerline and north 1/3 of Vineyard.
- No fissure issues.
- Could reduce footprint with basin and channels (easements and floodplains).
- Powerline and north 1/3 of Vineyard - no dam safety hazards.
- Sell excavated material.
- No overtopping for Vineyard Road and Rittenhouse.
- Improve drain downtime.
- Basins reduce erosion hazard in spillway.

Disadvantages:

- Spending \$5 MM on IDSM. Becomes throw away.
- Powerline Floodway might not have capacity for basin and channel.
- May have to wait for years to sell excavated material.
- Raising dams increases footprint of reservoirs.
- Get ASLD and CAP permits to take discharge to QC.

Comments:

Basin can't be so deep it does not drain. Queen Creek Wash has capacity to accept D/S flow.

Criteria	Score
Performance	5
Risk	4
Environmental	4
Multi-Use Opportunities	3
Social	3
Economic	2
TOTAL	21

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 6

Alternative: #9 - Offsite basins (downstream); Dam on Weekes Wash (offsite at northern end) (evaluate possible partners); Array of recharge stations further upstream of the dam (outside the modified easement area) to relieve pressure; Create a larger basin to go outside the modified easement east of US60 – replace with channel-basin system; Add right-of-way and add dam upstream; Storm drainage requirements for future development be altered to reduce flow to dams. (Includes 15, 21, 23, 30, 33)

Advantages:

- Increase overall capacity of system to PMF.
- Could probably meet drawdown criteria for existing RAC FRSs.
- Create more multi-use opportunities (ballparks, habitat, etc.)
-

Disadvantages:

- Additional right-of-way costs.
- Maintenance of new infrastructure (higher O&M).
- Difficulty in obtaining and working with multiple entities to reach agreement.
- Difficult planning / scheduling due to uncertainties.

Comments:

Assumed 3 existing dams stay in place. Relieve capacity problems and reduce outflow times.

Criteria	Score
Performance	4
Risk	2
Environmental	3
Multi-Use Opportunities	4
Social	3
Economic	2
TOTAL	18

Score 1-5, 5 = highest, 1 = lowest

**Powerline, Vineyard Road, Rittenhouse
FRS Rehabilitation or Replacement Project**

Initial Alternatives Evaluation - Group 4

Alternative: #10 - Additional spillways or outlets that spread the water more into natural flow paths.

Advantages:

- None
-
-
-

Disadvantages:

- More D/S flooding issues.
- More penetrations through dam.
- Doesn't meet flood protection criteria.
- Negative impacts on CAP (additional overshoots) and new Highway D/S.
- High cost.

Comments:

Recommend elimination.

Criteria	Score
Performance	1
Risk	1
Environmental	1
Multi-Use Opportunities	1
Social	1
Economic	1
TOTAL	6

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 4

Alternative: #11 - Rehab Powerline interim measure – adjust to make it a 100-year project life solution. Raise Vineyard and Rittenhouse.

Advantages:

- Links into future development scenarios / corridors.
- Straightforward solution - expedites.
- Existing footprint.
- Maintains mesquite bosque.
- Cost effective.
- Maintains flexibility for multi-use interests.

Disadvantages:

- Infrastructure costs could increase due to dam raise.
- Maintenance costs higher than basins.
-
-

Comments:

Risk - Powerline Fissure Area.

Criteria	Score
Performance	5
Risk	4
Environmental	5
Multi-Use Opportunities	5
Social	5
Economic	4
TOTAL	28

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 5

Alternative: #13 - Increase capacity of inundation pools and lower emergency spillways to allow more flow regularly.

Advantages:

- Increased storage capacity / better performance.
- Put in basins behind dams, rehab dam - allow low flow outlet (across CAP) to improve riparian habitat downstream.
- Design consideration for other alternatives as well.
-

Disadvantages:

- Cost (inverted siphon) or overshoot.
- Maintenance to clear pipe.
- Approval of CAP required.
-

Comments:

Environmental considerations - plants/animals and visual amenity for community. Floodplain corridor needs to be identified - impacts to future/downstream development. Duplicate with 37(11)/16 & 10 for drainage outlets to natural washes. No score but preserve design consideration for future.

Criteria	Score
Performance	
Risk	
Environmental	
Multi-Use Opportunities	
Social	
Economic	
TOTAL	<i>DS</i>

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 6

Alternative: #14 - Decommission the dams and restore original drainage channels. (must be evaluated for NRCS requirements)

Advantages:

- Cost of O&M.
- Some new riparian habitat.
- Enhance visual aesthetics.
- Make it easier to construct roads/highways.

Disadvantages:

- Multiple crossings of CAP.
- Redo FIRM, place properties into floodplains / remove existing flood control.
- Destroy existing bosque.
- Might need to increase/add protective element to CAP channels / diversions.

Comments:

Ranchers would loose existing water. Place existing properties into floodplains.

Criteria	Score
Performance	1
Risk	1
Environmental	3
Multi-Use Opportunities	2
Social	1
Economic	2
TOTAL	<i>10</i>

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 1

Alternative: #16 - Use a combination of rehabbing existing dams at existing elevation and use channels and basins to supplement.

Advantages:

- Do not have to remove or raise dams.
- Use the IDSM - so not a throw away.
- Multi-use connection to Q.C.
- Fill available for future development.
- Minimal impact to mesquite bosques.
- Smaller footprint than existing.

Disadvantages:

- Some adverse impact to mesquites.
- Visual barrier.
- Cost for fissure mitigation.
- Outlet to QC - outside of easement and gate to operation.

Comments:

Keep dams as well as future IDSM and deepen pools behind dams so that PMF does not overtop. Mitigate for Powerline fissure risk zones. Have gated outlet to Q.C. Economic score because of Powerline fissure.

Criteria	Score
Performance	5
Risk	4
Environmental	4
Multi-Use Opportunities	4
Social	3
Economic	2
TOTAL	22

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 2

Alternative: #17 - Replace earth fissure risk zone areas with channels and basins.

Advantages:

- Mitigate fissure.
- Eliminate need for costly soil cement core section in fissure areas
- Utilize Existing Powerline Floodway
-

Disadvantages:

- Reduced flood protection during events over 100-year.
- Can still have fissure failure with basins. Recommend Channels across higher risk zones that connect basins in lower risk zones.
-
-

Comments:

Assume basins/channel outside of mesquite bosque. See Alternative 6. The group added this alternative to alternative 6 in order to mitigate the Powerline and Vineyard Road Fissure Risk zones. It was assumed the southern half of Vineyard FRS would be combined with the new relocated, Rittenhouse FRS.

Criteria	Score
Performance	4
Risk	5
Environmental	3
Multi-Use Opportunities	3
Social	4
Economic	4
TOTAL	23

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 3

Alternative: #19 - Develop rough grading plans for common areas for developers to use fill material to assist with reducing footprint of structures, then rehab structures.

Advantages:

- Less footprint, more developable area.
- Sell excavated material.
- If you excavate enough material, no need to raise dam.
- Plan better for future multi-use options.

Disadvantages:

- No reduction of fissure risk.
- No timeline for selling excavated material.
- Still have to rehab dams.
-

Comments:

Hydrology Storage Volume must be developed for the scenario.

Criteria	Score
Performance	3
Risk	2
Environmental	3
Multi-Use Opportunities	4
Social	3
Economic	4
TOTAL	19

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 4

Alternative: #24 - Replace Powerline FRS, eliminate Powerline floodway, do a minor rehab of the dams, supplement all 3 to re-route flows to the south to Queen Creek. (excavated channel to Queen Creek)

Advantages:

- No dams needed, 100-year protection.
- Decreases footprint.
-
-

Disadvantages:

- More flow to Queen Creek.
- Ignore Powerline Floodway as a flood control facility.
- Mesquite bosque would be decimated.
- Less flood protection for D/S areas / CAP.

Comments:

Basin could be added west of Rittenhouse which could minimize flows to QC.

Criteria	Score
Performance	1
Risk	1
Environmental	1
Multi-Use Opportunities	3
Social	3
Economic	2
TOTAL	11

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 5

Alternative: #27 - Replace Powerline FRS with a 100-year channel to Vineyard, segment Vineyard into north ½ as dam, south ½ convert to a levee floodway to drain to south to a basin that replaces Rittenhouse that discharges to Queen Creek; keep Powerline Floodway. (Team to revisit for best possible scenario)

Advantages:

- Risk for fissures reduced.
- Less water going down Powerline floodway.
-
-

Disadvantages:

- Putting more water into Queen Creek (unless it was attenuated).
- Negative upstream impact to vegetation and habitat.
- Cost of redirecting flow south toward QC.
-

Comments:

Balance flows between Powerline and QC. Risk was evaluated as a score of 4 or 5 depending on QC.

Criteria	Score
Performance	3
Risk	4/5
Environmental	2
Multi-Use Opportunities	4
Social	4
Economic	3
TOTAL	<i>20/21</i>

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 6

Alternative: #28 - Replace both Powerline and Rittenhouse with 100-year channels; raise Vineyard Road to accept flows; discharge all to Powerline Floodway.

Advantages:

- No rehab of two FRSS / negates IDSM.
- More land freed up (bigger basin for Vineyard).
- Permanent solution to Powerline fissure.
-

Disadvantages:

- Raise in Vineyard visual impacts.
- More difficult to cross with arterial roads.
- Failure could be more catastrophic.
-

Comments:

Positives and negatives pretty well balanced across the board.

Criteria	Score
Performance	3
Risk	3
Environmental	3
Multi-Use Opportunities	4
Social	2
Economic	3
TOTAL	18

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 1

Alternative: #31 - Channelize Powerline through a certain point in Vineyard, raise remaining portion of Vineyard, rehab Rittenhouse.

Advantages:

- Avoid having a dam in an earth fissure zone (both Powerline and Vineyard).
- For remainder of dams - use existing dams.
- Multi-use connection to QC.
-

Disadvantages:

- Diminish recreation aspects.
- Impact mesquites.
- Outlet to Q.C. outside of easement / operate manually gate.
- Do not use IDSM.
- Relocate emergency spillway.

Comments:

Eliminate Powerline FRS - low flow channel to Powerline Floodway (splitter structure), larger flows are channelized to Vineyard which has been elevated to handle the additional flows. Portion of Vineyard is removed to south of fissure zone (so North 1/3 of Vineyard). Gated outlet to Q.C. from Rittenhouse.

Criteria	Score
Performance	4
Risk	4
Environmental	2
Multi-Use Opportunities	2
Social	2
Economic	2
TOTAL	16

Score 1-5, 5 = highest, 1 = lowest

**Powerline, Vineyard Road, Rittenhouse
FRS Rehabilitation or Replacement Project**

Initial Alternatives Evaluation - Group 2

Alternative: #32 - Optimize channels, basins, dams at least cost possible that meets project purpose.

Advantages:

-
-
-
-

Disadvantages:

-
-
-
-
-

Comments:

Group considered this a design consideration. If consultant identifies another alternative that deals with basin/channel alternative combinations not identified within this meeting, then it should be pursued.

Criteria	Score
Performance	
Risk	
Environmental	
Multi-Use Opportunities	
Social	
Economic	
TOTAL	<i>DS</i>

Score 1-5, 5 = highest, 1 = lowest

Powerline, Vineyard Road, Rittenhouse FRS Rehabilitation or Replacement Project

Initial Alternatives Evaluation - Group 3

Alternative: #35 - ASLD ideas to minimize footprint: depending on North/South ADOT corridor being proposed (unidentified location), use a channel adjacent and parallel to North/South corridor to flow into Queen Creek (North/South corridor would need to be a FEMA certified road). Future north/south freeway, US60 bypass, and 802 used as levees.

Advantages:

- May not need to raise dams for rehab.
- Reduce footprint and floodplain / more developable area.
- Cost sharing partner / reduce cost.
- Utilize IDSM.

Disadvantages:

- Prolonged time period before construction (>20 years at least).
- Certify levees, maintain basins.
- No fissure/dam risk reduction.
- No change to draw down time.
- Increase overall footprint of floodplain footprint in ASLD.

Comments:

Criteria	Score
Performance	5
Risk	1
Environmental	2
Multi-Use Opportunities	4
Social	2
Economic	3
TOTAL	17

Score 1-5, 5 = highest, 1 = lowest

**Powerline, Vineyard Road, Rittenhouse
FRS Rehabilitation or Replacement Project**

Initial Alternatives Evaluation - Group 4

Alternative: #37 - Leave all 3 dams in place – upgrade cut-offs, emergency spillways, and sizes as needed. Upgrade or rehab all 3 dams.

Advantages:

-
-
-
-

Disadvantages:

-
-
-
-
-

Comments:

Same as #11.

Criteria	Score
Performance	5
Risk	4
Environmental	5
Multi-Use Opportunities	5
Social	5
Economic	4
TOTAL	28

Score 1-5, 5 = highest, 1 = lowest

**Powerline, Vineyard Road, Rittenhouse
FRS Rehabilitation or Replacement Project**

Initial Alternatives Evaluation - Group 5

Alternative: #38 - Reduce the size of the existing structures to approx. 6 feet to protect mesquite bosque, and install basins outside the mesquite bosque; Decrease height, increase capacity, and increase floodway of Powerline.

Advantages:

- Protect vegetation.
- Decrease peak water surface elevation behind dam.
- Multi-use.
- Low Maintenance.

Disadvantages:

- Big, deep basins - cost.
-
-
-
-

Comments:

Criteria	Score
Performance	4
Risk	5
Environmental	3
Multi-Use Opportunities	4
Social	4
Economic	4
TOTAL	24

Score 1-5, 5 = highest, 1 = lowest