anderson perry & associates, inc.

engineering • surveying • materials testing

October 27, 2006

Walla Walla County
P.O. Box 813
Walla Walla, Washington 99362

ATTN: Mr. John Dirr

RE: Cottonwood Road Drainage Improvements

Dear John:

On March 13, 2006 we provided you with the Cottonwood Road Stormwater Routing and Detention Analysis. This report outlined the long-term options for handling the Cottonwood Road stormwater associated with the road from Russell Creek to the Kendall Road intersection. A copy of the report is attached for reference. We then met with you and Phil Merrell on March 22, 2006 to review the report and to obtain further directions. At the meeting, you requested we provide a follow-up to the report that incorporates your decisions. This letter is the requested report.

Your comments and directions are summarized as follows:

- The timing of the reconstruction of Cottonwood Road from Russell Creek to Kendall Road is unknown. Some of the construction may take place as part of future developments.
- The stormwater improvements can happen independent of the road project.
- We need to prepare a hybrid of Option 4 which will be called Option 4A that incorporates the decisions made at the meeting (see Figures 1 and 2).
- The culvert in Kendall Road will remain in place and stormwater from Area A will be allowed to pond as it does now. Flow through the culvert will go into the new pond.
- Stormwater from Area B shall be diverted off of Cottonwood Road and into the new pond.
- Consider a control structure on the Kendall Road structure that allows the pipe to be closed and the water diverted into a new overflow pipe.

- Look at the options of piping or ditching overflow stormwater out of the new pond into the facilities already in place.
- Address the discharged stormwater from the existing structure at Cottonwood Road and Eagle Crest Drive.
- Provide a cost estimate for the selected option.
- Provide an estimate on the amount of land needed.
- Discuss possible design criteria for future developments in Area C.
- If possible, the new pond should be in a cut section.

Our surveyor's visited the site and gathered specific elevation data shortly after our meeting with you. The additional elevation data allowed us to analyze the feasibility of Option 4A. The survey data also allowed us to verify that the pond could be excavated without the need for fill slopes on the downstream side of the pond. Both conditions were found to be possible and we proceeded to further detail this option (see Figures 1 and 2 for additional information).

Multiple features are shown in Figure 1 that should help the overall system function better while considering long-term maintenance costs. These features include:

- All exposed pipe ends will receive a headwall, trash rack and with riprap energy dissipators.
- The bottom of the pond is divided into three cells by rock check dams to help contain sedimentation.
- The sides of the pond will be hydroseeded with a dry land seed mix that will not need to be mowed. The bottom of the pond will not be seeded.
- The pond is designed to infiltrate runoff into the ground, which will decrease the amount of runoff allowed to continue downstream. This will reduce erosion and sedimentation of the existing ditches.
- Gravel access roads have been provided around the pond along with access to the bottom of the pond.
- The area upstream of Kendall Road and west of Cottonwood Road (Area B) is being routed into the pond which will reduce flows in the existing Cottonwood Road ditches downstream of the pond.
- Dual overflow structures have been provided at the downstream end of the pond to reduce the risk of debris blocking the outlets.

- The existing culvert will remain in place. A new manhole and new pipe will be installed at the downstream end of the existing culvert to route all runoff into the new pond. This will eliminate the need for a control structure that would require manual operation.

Annual maintenance will consist of monitoring the system during the spring and early summer. Upstream pipes should be flushed into the pond as needed. If pond sedimentation is deeper than one foot, the maintenance crews should remove the sediments from each cell. The quarry spall check dams should be designed and constructed so they can be driven over. An access route may need to be constructed across the bottom of the pond depending on whether the bottom is saturated or not. Upon completing the maintenance, the pond bottom should be scarified and check dams repaired if damaged.

Additional improvements to the regional system should be considered along Cottonwood Road from Russell Creek to Eagle Crest Drive. This portion of Cottonwood Road is anticipated to have high groundwater. Furthermore, the existing 48-inch diameter pipe will not be able to connect to Russell Creek because there is not enough elevation fall from the creek to Eagle Crest Drive where the pipe currently ends. A swale adjacent to the east side of the road should be constructed (see Figure 3 for additional information). The minimum size of the swale should be 2-feet deep with 4:1 side slopes and a 2-foot wide bottom, resulting in an 18-foot wide swale. The swale would be constructed at the back edge of the proposed multiuse path. The minimum slope should be 1 percent where practical. The swale should be hydroseeded with a dry land seed mix. Check dams should be utilized to help pond runoff for infiltration and sediment treatment purposes. Costs for this swale are included in the Cost Estimate as Item 5. Additional cost for right-of-way for the new swale is not included in the cost estimate.

We prepared a Preliminary Construction Cost Estimate and included it as Attachment No. 1. The two largest costs associated with the pond are the excavation ($420,000) and the extension of the pipe (±2,400 feet) in Cottonwood Road from the existing pipe end to the new pond ($156,000). There are not many options to reduce the costs of the pipe. We are proposing HDPE to match the material previously used for the existing pipe. HDPE pipe is usually the most cost effective material for larger pipes. We estimate the cost for excavation including off-site haul at $12 per cubic yard. This cost may be reduced if the disposal is kept-on-site in the adjacent field. Topsoil management would need to be performed if this option is pursued. The estimated costs listed are based on bid costs for 2006 and will need to be adjusted accordingly in the future. The costs do not include final design, construction engineering, surveying, property acquisition for the new pond (±4.7 acres), right-of-way acquisition for the new swale (±0.5 acres), or asphalt surface repair if the new pipe is installed separate from the Phase 2 road construction project and in the existing roadway. As you can see, this project is a large undertaking. We have not attempted to factor in construction of portion of the project by developers. As a related side note, it is our understanding the City of Walla Walla would like to eventually construct a water reservoir in this general area. We do not know any specifics, but it may be worth while to see if the pond location is close to where a reservoir might work. If so, there may be some efficiency in combining the land acquisition efforts.

If this project is constructed, it will greatly reduce the risk of flooding private property from upstream sources of Kendall Road. Considerations for runoff inside Area C (see Figure 3 and the March 13 report) must also be addressed, so design standards can be identified for future developments. When Area C is developed, it needs to contain the increase in runoff between the pre- and post-developed conditions so existing downstream facilities are not impacted negatively. Those future improvements may include drywells, swales/ditches, pipes, and/or an additional pond. From previous calculations for Area C, the existing runoff for a 100-year, 24-hour storm event is approximately 10 cfs.

In summary, Figures 1, 2, and 3 show the proposed conceptual plan for regional drainage improvements needed to reduce the risk of flooding private property, such as the May 8, 2005 storm event and subsequent runoff. In addition, we have included recommendations for annual maintenance for the proposed system. We feel a follow-up meeting between the County and Anderson·Perry should be scheduled in the upcoming weeks. The purpose of that meeting would be to discuss the specifics contained in this letter in addition to reaching a mutual agreement that this letter completes the Preliminary Engineering Phase Tasks 1-7 and 1-8 in our Cottonwood Road Stormwater Project Task Order with the County.

Please call or email me if you have any questions or comments.

Sincerely,

ANDERSON·PERRY & ASSOCIATES, INC.

By _____
Jeremy D. Morris, P.E.

JDM:amw

Attachments

cc: Steve Stanton, Anderson·Perry, w/attach
Howard Boggs, Anderson·Perry
File W394-97-01, w/attach

S:\DOCS\WW COUNTY\W394-97 COTTONWOOD STORM DRAIN DES\POND IMP\RECOMMENDATIONS.doc

NEW 60"ø SDMH WITH OVERFLOW OPENING AT ELEVATION 992.0

NEW HEADWALL AND TRASH RACK

QMAX=70 CFS

Q 100YR – 24HR=±107 CFS (AREA A)

B FIG 2

LIGHT RIP–RAP BANK PROTECTION

EXISTING 30" CMP CULVERT

USE ±500YD FROM POND³ EXCAVATIONTO PROVIDE 3–FEET OF COVER OVER THE PROPOSED PIPE

310 LF 42ø HDPE SD PIPE, S = 1.0%

NOTES:

1. SEE FIGURE 1 IN THE 3/13/06 LETTER REPORT FOR AN OVERVIEW OF THE AREA.
2. THE CAPACITY OF THE NEW STORM WATER POND IS APPROXIMATELY 920,000 FT³ (ELEV = 994 TO 982) WHICH INCLUDES ±220,000 FT³ OF FREEBOARD (ELEV = 994 TO 992).
3. APPROXIMATELY 4.7 ACRES OF LAND WILL BE REQUIRED TO CONSTRUCT THE NEW POND FACILITY.

N

SCALE IN FEET 40 0 40 80 160

HYDROSEED ALL DISTURBED SLOPES/SOIL ONLY. DO NOT SEED BOTTOM OF POND.

MAINTENANCE ACCESS 6" THICK CRUSHED SURFACING TOP COURSE

OUTLET STRUCTURE (TWO–WSDOT TYPE 1 WSDOT DROP INLETS). GRATE ELEV = 991.0

HEADWALL AND TRASH RACK

LIGHT RIP–RAP BANK PROTECTION

CHECK DAM SEE FIGURE 2

A FIG 2

NATIVE SOIL DO NOT COMPACT BOTTOM OF POND

KENDALL ROAD

LIGHT RIP–RAP BANK PROTECTION

HEADWALL AND TRASH RACK

CONTINUE 42"ø HDPE PIPE ±2,400 LF TO NORTH. NEW 60"ø SDMH SPACING ±400 LF.

42"ø HDPE SD PIPE, S=1.0% TO 2.0% (MAX) QMAX=120 CFS

NEW 60"ø SDMH

80 LF 42"ø HDPE SD PIPE, S = 1.0%

COTTONWOOD ROAD

POWERLINE ROAD

27"ø CMP CULVERT; S=9% VMAX=12 FPS QMAX=50 CFS

HEADWALL AND TRASH RACK LOCATION TO BE DETERMINED AT FINAL DESIGN

Q 100YR – 24 HR=42 CFS (AREA B)

FIGURE 1

WALLA WALLA COUNTY

COTTONWOOD ROAD DRAINAGE IMPROVEMENTS

CONCEPTUAL DESIGN NEW POND OPTION 4A

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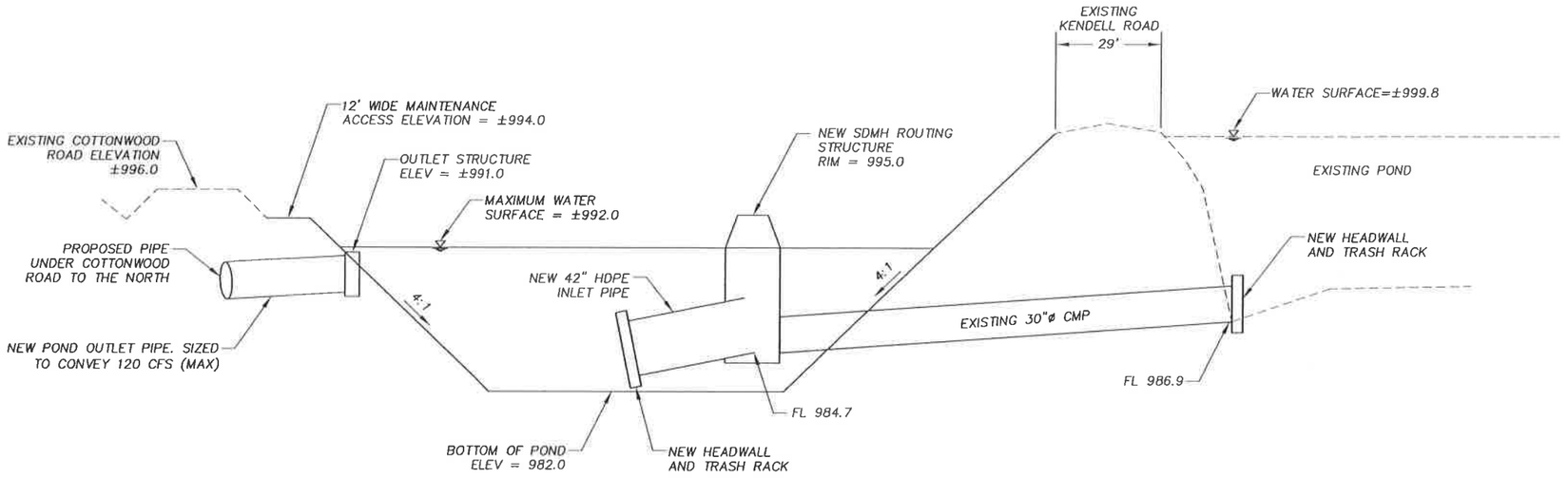
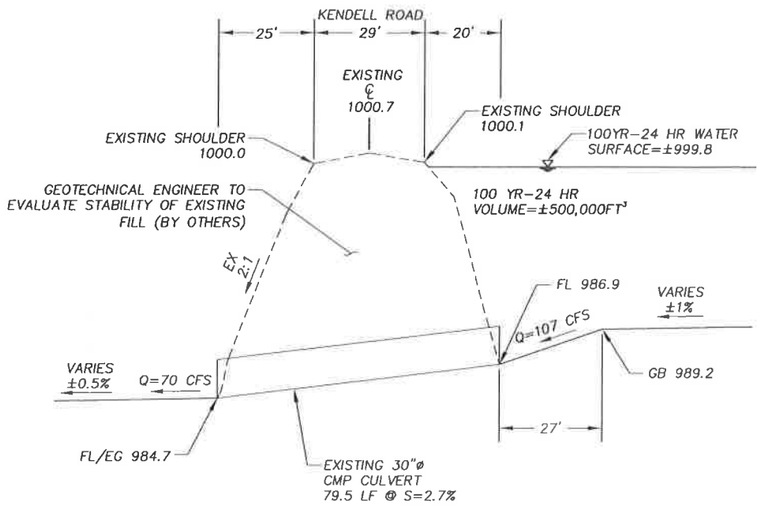


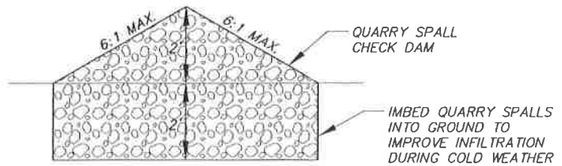
NEW POND SCHEMATIC CROSS SECTION

NTS



B FIG 1 **EXISTING POND/ROAD**

NTS



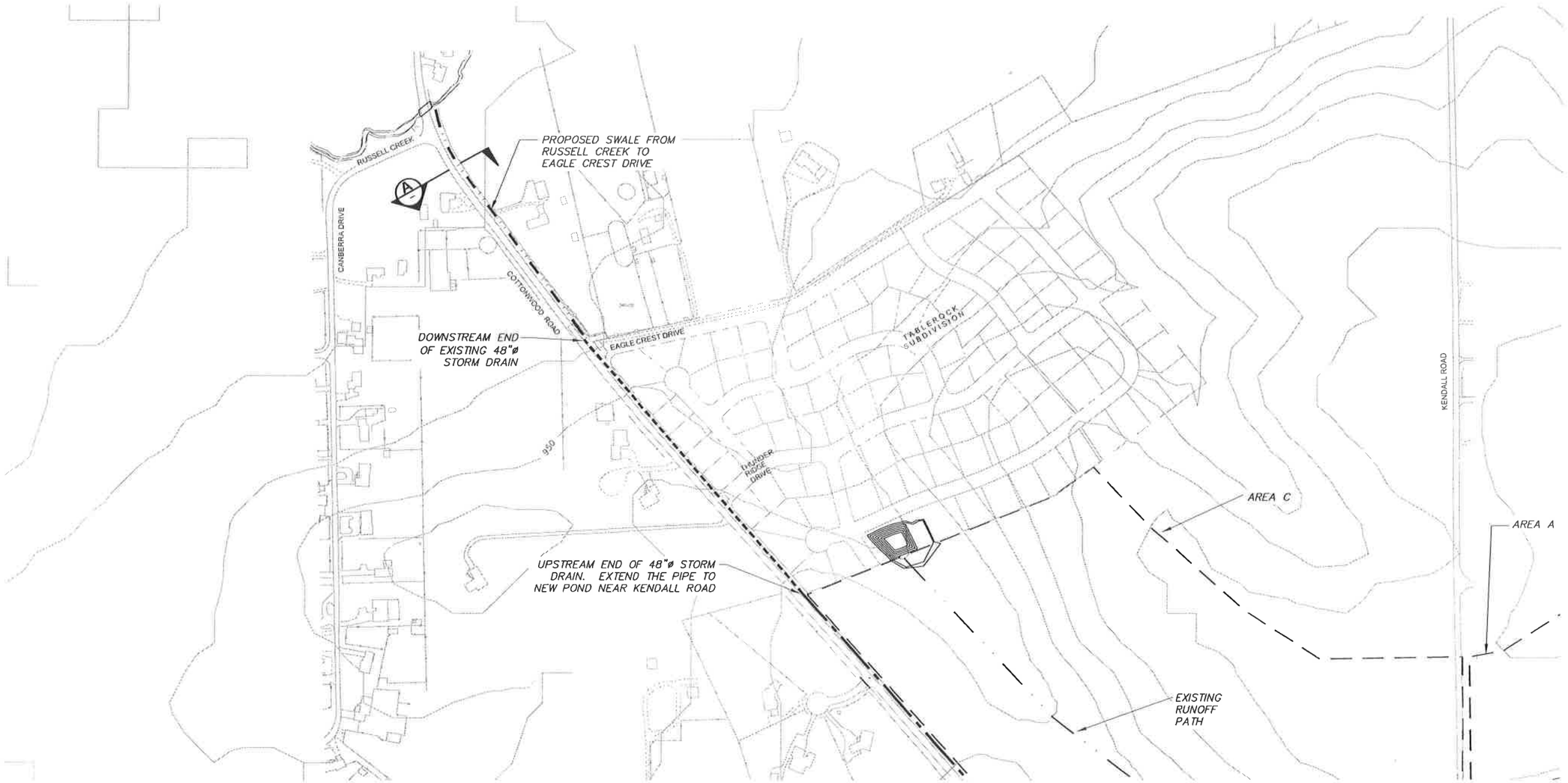
A FIG 1 **NEW POND CHECK DAM**

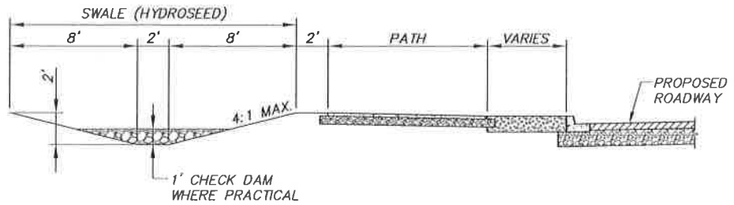
NTS

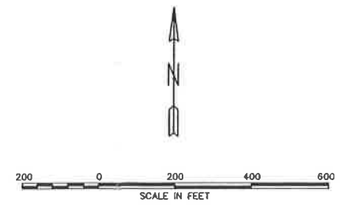
FIGURE 2

WALLA WALLA COUNTY
COTTONWOOD ROAD DRAINAGE IMPROVEMENTS
DETAILS
OPTION 4A

anderson perry & associates, inc.







PROPOSED SWALE FROM RUSSELL CREEK TO EAGLE CREST DRIVE

A – NTS

WALLA WALLA COUNTY

COTTONWOOD ROAD DRAINAGE IMPROVEMENTS

PROPOSED SWALE OPTION 4A

FIGURE 3

anderson perry & associates, inc.

R:\Clients\Walla Walla County\Road\W394-97 Storm water Cottonwood RD\dwg\Figure 3.dwg, 10/27/2006 3:14:14 PM, 1:2

ATTACHMENT NO. 1

Walla Walla County
Cottonwood Road Drainage Improvements
Preliminary Construction Cost Estimate
October 27, 2006

NO.	ITEM	UNIT	UNIT PRICE	AMOUNT	TOTAL PRICE
1	Mobilization	LS	$ 50,000	All Req'd	$ 50,000
2	Temporary Maintenance and Protection of Traffic, including Flaggers	LS	30,000	All Req'd	30,000
3	Clearing and Grubbing	LS	15,000	All Req'd	15,000
4	Excavation, including Haul	CY	12	35,000	420,000
5	Ditch (Swale) Excavation, incl. Haul	CY	15	800	12,000
6	Quarry Spalls	CY	35	220	7,700
7	Crushed Surfacing Top Course	TON	14	1,300	18,200
8	Light Riprap Bank Protection	CY	50	180	9,000
9	Headwall and Trash Rack	EA	7,500	4	30,000
10	Manhole, WSDOT Type 1 (60 inches)	EA	4,000	9	36,000
11	27-inch CMP Storm Drain Pipe	LF	50	300	15,000
12	42-inch HDPE Storm Drain Pipe	LF	65	3,000	195,000
13	Drop Inlet, WSDOT Type 1	EA	4,000	2	8,000
14	Trench Safety	LF	1	3,250	3,250
15	Temporary Erosion Control	LS	5,000	All Req'd	5,000
16	Hydroseed (new pond and new swale)	AC	2,500	5.2	13,000
				Subtotal	**$ 867,150**
				Contingency (10%)	**$ 86,715**
				Total *	**$ 953,865**
	Property for New Pond (±4.7 AC) at Intersection of Kendall Road and Cottonwood Road		TBD		
	Right-of-Way for New Discharge Swale (±0.5 AC) Russell Creek to Eagle Crest Drive		TBD		

* This estimate excludes the final stormwater design, construction engineering, surveying, property acquisition for new pond, right-of-way for new swale, asphalt surface repair if new pipe is installed in existing roadway, etc. It assumes the pipeline is installed as part of the Phase 2 Cottonwood Road Reconstruction Project.

W394-97-01

anderson perry & associates, inc.

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March 13, 2006

Walla Walla County
P.O. Box 813
Walla Walla, Washington 99362

ATTN: Mr. John Dirr, P.E.

RE: Cottonwood Road – Stormwater Routing and Detention Analysis

Dear John:

As a part of our task order with Walla Walla County for the Cottonwood Road stormwater project, we were asked to provide an area wide stormwater report that explored options for handling the stormwater from the area east of Kendall Road and the area between Kendall Road and the Tablerock Phase 2 development. This letter will serve as the report. Our goal is to end up with an approved plan. After you have a chance to review the information, we would like to meet with you to further clarify and explain the options. Hopefully you will then be able to select one of the options for implementation

The study area includes existing roadways, private land likely to be developed, and private land that is unlikely to be developed. This means it is likely that any selected option will be built in phases and possibly by different parties. We tried to keep this in mind as we developed the options.

The report is divided into the following sections:

- Background Information
- Existing Conditions
- Soil Types
- Rainfall and Runoff Analysis
- Options
- Impacts to Existing Property Owners
- Ballpark Construction Costs
- Operation and Maintenance
- Water Quality Considerations
- Conclusions

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☐ La Grande, Oregon 97850-0939 / 1901 N. Fir, P.O. Box 1107 / (541) 963-8309, Fax (541) 963-5456

BACKGROUND INFORMATION

A large storm event occurred on May 8, 2005 that caused significant damage to property in the vicinity of Cottonwood Road, west of Kendall Road. According to the rain gauges of two local residents, the storm event had a total rainfall of 1.0 to 1.1 inches in approximately 20 minutes. This event and its resulting damage has focused attention on the runoff potential in this area, especially in light of the expected current and future development there. We provided verbal and written input on the situation including letters dated May 25, 2005 and July 21, 20005. Some of the information in the prior communications was used in this report.

As a part of our analysis for this report, we used the existing contours shown on the Walla Walla County GIS maps to define the approximate upstream tributary areas. For our previous correspondence with the County and Paul Gatewood, we used USGS contours. Both sources appear to generally represent the area and additional field verifications do not appear to be warranted at this stage. There are minor differences in the tributary areas defined from the two different sources resulting in slightly different calculated flow rates. Our intent is to use the contours from the County's GIS archives for future correspondence.

For this analysis, we used the Soil Conservation Service (SCS) TR-55 Method to calculate flows. In our previous correspondence to analyze the amount of runoff, we used the Santa Barbara Hydrologic Analysis Method with non-frozen conditions. The SCS method is one of the methods approved for use by the Washington State Department of Transportation (WSDOT) and the Stormwater Management Manual for Eastern Washington and is utilized more often in this area. The peak flows calculated using the SCS method are approximately 25 to 35 percent larger than the peak flows calculated with the Santa Barbara Method. We feel the SCS method is the most appropriate choice for this report as the County works toward a long term solution.

EXISTING CONDITIONS

Tributary Areas

For purposes of analysis, we defined three distinct areas. See areas A, B, and C on Figure 1 attached.

Area A

Area A is upstream of the Tablerock Subdivision, upstream of Area C, and extends east from Kendall Road. It extends approximately 3 miles east through

the farm fields toward the Blue Mountains and contains approximately 561 acres. Specific information on the area is summarized as follows:

- The upper ±5,900 feet are conveyed by an undefined swale with a slope of ±2.3 percent.
- The lower ±9,400 feet are conveyed by a defined swale with a slope of ±1.6 percent.
- The existing culvert at Kendall Road is 30-inch diameter with a slope of approximately ±2.4 percent.
- The possible maximum culvert headwater depth at Kendall Road is approximately 10 feet.
- This area is north of Cottonwood Road and east of Kendall Road.

Area B

Area B is south and west of Area A and includes the runoff area adjacent to and south of Cottonwood Road. It is similar in length to Area A and contains approximately 207 acres. Normally, most of the runoff flow stays in the Cottonwood Road ditches. However, the runoff can be a tributary to Area C when the existing culvert near the intersection of Kendall Road and Cottonwood Road is blocked with debris. Other attributes of this area are described below.

- The length is approximately ±17,500 feet.
- The area consists of undefined swales in combination with existing roadside ditches.
- The average slope = ±2 percent
- The area is mostly south of Cottonwood Road.
- A culvert on the south side of Cottonwood Road at the Kendall Road intersection was blocked and diverted runoff into tributary Area C during last year's event.

Area C

Area C is directly above the existing pond constructed as part of the Tablerock Phase 2 project and contains approximately 54 acres. Specific information on the area is summarized as follows:

- The undefined swale length is approximately 2,370 feet
- It is downstream of Area A (and possibly Area B if existing culvert at Kendall Road and Cottonwood Road is blocked).
- The average slope is approximately 1.7 percent
- The area is west of Kendall Road and north of Cottonwood Road

Existing Pipe and Pond Network

- There is an existing stormwater pond at the low end of Area C. It was installed as part of the Tablerock Phase 2 project. The pond has capacity to store approximately 70,000 cubic feet of runoff. Approximately 58,000 cubic feet of the total storage is above the inlet level.
- Two 24-inch pipes exit the stormwater pond and extend side by side to Cottonwood Road. The minimum slope of the pipes is 0.50 percent. The pipes can convey up to 52 cubic feet per second (cfs) combined or 26 cfs each. There is an outlet structure with 3 – 2-foot x 4-foot grates for each of the pipes. The outlet structures are interconnected. A culvert analysis was performed using 4 feet of headwater above the crown of the pipes.
- The 24-inch pipes connect to a 48-inch diameter pipe in Cottonwood Road which can convey between 120 cfs (full flow; gravity) and 165 cfs (culvert analysis with approximately 14 feet of head at the upstream manhole).
- There is an existing 30-inch diameter culvert across Kendall Road between Areas A and C (see Figure 1). It has a calculated capacity of 70 cfs (culvert analysis with 10 feet of head).
- Historically, stormwater has ponded upstream of Kendall Road during larger storm events. The existing pond's 100-year, 24-hour storage volume is approximately 500,000 cubic feet. This volume is based on the peak flow capacity of the existing 30-inch diameter culvert (70 cfs). The culvert flow varies and is dependent on the depth of runoff retained upstream of Kendall Road. The inundated area is approximately 5.0 acres. The amount stored above Kendall Road will vary with the storm characteristics. Short duration, high intensity

storms will fill up the existing pond faster than long duration, low intensity events.

SOIL TYPES

The soil types vary from RVB (Ritzville very fine sandy loam, 0 to 8 percent slope) to WaB/WaD (Walla Walla silt loam, 0 to 8 and 8 to 30 percent slopes) pursuant to the United States Department of Agriculture (USDA) Soil Survey Maps that are published online. The hydrologic soil group for these soils is Group B.

RAINFALL AND RUNOFF ANALYSIS

The above information was used to calculate peak flows for 25-year and 100-year, 24-hour storm events for the east edge of the Walla Walla Valley (2.4 inches and 2.8 inches of total rainfall). The total rainfall is from the NOAA published Isopluvials Maps dated September 1970. The SCS method (TR-55 Tabular) was used to analyze the routing and storage requirements. A curve number of 73 was initially chosen because the most common cover type is wheat and the land is generally contoured and covered for most of the year. Antecedent runoff condition Type III was assumed for saturated and/or frozen conditions. The result was that the curve number was increased from 73 to 87.

Based on the information listed above, the approximate peak runoff (frozen conditions) for the 25-year, 24-hour storm event and the 100-year, 24-hour storm events calculated are summarized as follows:

Area	Approximate Size (Acre)	Peak 25-year, 24-hour Flow (cfs)	Peak 100-year, 24-hour Flow (cfs)
A	561	84	107
B	207	33.5	42
C	54	8	10

OPTIONS

With the above calculated flows, several options were formulated to improve the existing routing and existing storage for large storm events. Even though the existing 24-inch storm drain pipes installed for the Tablerock Phase 2 project can convey 56 cfs maximum, for safety factor reasons it is recommended that no more than 45 cfs (80 percent) be released toward the existing subdivision. The options depicted are similar in nature, but differ in the locations and geometry of the ponds and routing considerations. The options are as follows:

- **Option 1 (Figure 2)**: Modify the size and elevation of the existing 30-inch diameter culvert such that only 15 cfs is allowed to pass through the culvert. The existing Tablerock pond would receive 25 cfs (15 cfs from Area A plus 10 cfs for Area C). The volume of runoff detained for a 100-year, 24-hour storm event would be approximately 1,500,000 cubic feet which includes runoff from Area A. New culverts may need to be installed to keep Area B from being directed into Areas A or C. If the water reached the top of Kendall Road, the inundated area would be ±8.5 acres. Grading may be necessary to enlarge the inundation area upstream of Kendall Road based on the required volume and existing roadway elevation. The structural integrity of the road for detaining water would also need to be verified. Area A will continue to pass the 15 cfs through the project, even if the land is developed in the future. The specific method of conveyance would need to be determined as a part of future development.

  As previously mentioned, Area B can overflow into Area's A and C in large storm events. The best short term solution is to replace the existing culvert south of the Kendall Road and Cottonwood Road intersection. Long term, after Cottonwood Road is widened, Area B runoff will need to be treated near the intersection and directed into the new drainage facilities. The treatment can be a small compact mechanical system or a separate pond for a more natural treatment. We would like to discuss this when we sit down to talk with the County about preferences.

- **Option 2 (Figure 3)**: Modify the size and elevation of the existing 30-inch diameter culvert such that only 25 cfs is allowed to pass through the culvert and store everything from Area C in an expanded pond by Tablerock Phase II. The pond upstream of Kendall Road would have to detain approximately 1,100,000 cubic feet of runoff for the 100-year, 24-hour storm event which includes Area A. The inundated area for the pond upstream of Kendall Road is ±7.5 acres. Furthermore, the volume of the existing Tablerock pond should be increased to 450,000 cubic feet in order to accommodate 25 cfs from Area A and 10 cfs from Area C. The Tablerock pond would be expanded to ±1.7 acres. The side slopes and depth of the modified Tablerock pond could be constructed such that farming of that land would be impacted minimally.

  As previously mentioned, Area B can overflow into Area's A and C in large storm events. The best short term solution is to replace the existing culvert south of the Kendall Road and Cottonwood Road intersection. Long term, after Cottonwood Road is widened, Area B runoff will need to be treated near the intersection and directed into the new drainage facilities. The treatment can be a small compact mechanical system or a separate pond for a more natural treatment. We would like to discuss this when we sit down to talk with the County about preferences.

- **Option 3 (Figure 4)**: Modify the size and elevation of the existing 30-inch diameter culvert such that only 35 cfs is allowed to pass through. The volume of runoff detained for a 100-year, 24-hour storm upstream of Kendall Road would be 850,000 cubic feet which includes Area A. The area of this pond would be approximately 6.5 acres. The existing Tablerock pond would not be modified from its existing configuration. A second pond would be constructed near the midpoint between Kendall Road and the existing Tablerock Subdivision. The approximate volume of this pond would need to be 750,000 cubic feet which includes 35 cfs from Area A and 42 cfs from Area B. The area of the middle pond would be approximately 5.5 acres. A peak flow of 45 cfs would be released from the middle pond to the Tablerock pond. At the request of the County, the new pond could be designed such that impacts to the existing farming of the pond area would be minimal.

  As previously mentioned, Area B can overflow into Area's A and C in large storm events. The best short term solution is to replace the existing culvert south of the Kendall Road and Cottonwood Road intersection. Long term, after Cottonwood Road is widened, Area B runoff will need to be treated near the intersection and directed into the new drainage facilities. The treatment can be a small compact mechanical system or a separate pond for a more natural treatment. We would like to discuss this when we sit down to talk with the County about preferences.

- **Option 4 (Figure 5):** Do not modify the existing 30-inch diameter culvert. The area east of Kendall Road currently floods during large storm events. The existing volume of runoff for Area A is approximately 500,000 cubic feet for the 100-year, 24-hour storm event. The existing pond potentially inundates approximately 5.0 acres (see Figure 5). A second pond would need to be constructed immediately southwest of the existing Kendall Road 30-inch diameter culvert. Area B would flow into this new pond with the installation of a new culvert(s). The second pond would have an available volume for detention of stormwater equal to 1,150,000 cubic feet and would be interconnected to the upstream pond by the existing culvert under Kendall Road. The new pond west of Kendall Road will have an area of approximately 3.5 acres. The new pond would release a maximum 35 cfs downstream toward the existing Tablerock pond. The existing Tablerock pond would receive 45 cfs (35 cfs from the new pond + 10 cfs from Area C).

- **Option 4A (Figure 6):** Extend the existing 48-inch pipe (approximately 1/2 mile) in Cottonwood Road to near the Kendall Road Intersection as an alternate to routing runoff toward the existing Tablerock Subdivision. The extended pipe will most likely be smaller than the current 48-inch diameter pipe because the natural slope of Cottonwood Road increases toward the east. This would increase the amount of runoff allowed to be passed downstream when compared to the previous options.

Downstream improvements will be necessary north of Eagle Crest Drive in order to adequately convey the runoff to the existing creek network. We would recommend no more than 120 cfs be allowed to pass through the pipe. That flow is equal to the pipe's gravity flow capacity. Technically, no runoff storage would be required above the existing storage volume that is already detained by the existing culvert at Kendall Road. The existing/unchanged peak flow from Area A is ±70 cfs through the existing culvert. In addition Area B can contribute up to 42 cfs. In a worst case scenario, the combined flows from Areas A and B (112 cfs) would be routed into the new pipe and downstream in Cottonwood Road. By extending the large diameter pipe up to Kendall Road, it could save the cost of constructing a large pond for storage and only require a much smaller pond for treatment purposes. Runoff treatment should be considered as close to the source as possible and a stormwater runoff treatment pond should be installed immediately downstream of Kendall Road. The Stormwater Management Manual for Eastern Washington references a source that recommends the first 0.5 inches of rainfall be treated which calculates to be less than 50 percent of the 2-year, 24-hour. We would recommend increasing the treatment amount to approximately 1.5 inches (5-year, 24-hour event) of rainfall be treated for an additional safety factor and to provide adequate room for siltation. Larger storm events would fill up the pond and then will be released safely to the larger diameter pipe in Cottonwood Road. The resulting pond volume required for treatment will be approximately 650,000 cubic feet. The stormwater will be released at ±8 cfs for smaller storm events, and the pond should drain in approximately 24 hours. By extending the large pipe and constructing a treatment pond, it will reduce the risk of damage to private property by directing the runoff to a safer discharge location. A channel along Cottonwood Road is not feasible due to the existing negative slope and topography on the north and east side of Cottonwood Road. A pipe is probably the best solution. It must be appropriately designed and have an emergency overflow path that is contained in the roadway in order to reduce the risk of stormwater impacts to private property.

IMPACTS TO EXISTING PROPERTY OWNERS

All of the options impact existing properties that are not owned by the County. That being said, one of the objectives should be to impact as few properties as possible. Options 1 through 4 impact two or more properties. While those options reduce the risk of future flooding, there is still some risk because runoff is still naturally directed toward private property, some of which currently have existing houses. Option 4A is the only option that redirects the runoff away from its current path and into a proposed public improvement. This option also does not negatively impact the property to the east of Kendall Road because the existing culvert does not need to be modified. Option 4A only impacts a triangular piece of property (±3.5acres) immediately west of Kendall Road near the intersection of Cottonwood Road and Kendall Road (see Figure 6).

BALLPARK CONSTRUCTION COSTS

It is very difficult and time consuming at this stage to prepare reasonable cost estimates for these options. In an effort to be cost efficient with our time, we are proposing to prepare cost estimates after reviewing the options with County staff.

OPERATION AND MAINTENANCE

The County has ongoing responsibilities to operate and maintain drainage systems in the study area. All options will also involve some operation and maintenance efforts and costs. Some could be placed upon future developments and some could be transferred to the City of Walla Walla upon annexation. We would like to discuss the operation and maintenance costs in general at our meeting and then provide a more detailed follow-up on the preferred option(s).

WATER QUALITY CONSIDERATIONS

Even though all options detailed in the previous section detain runoff, the stormwater is being released after a short period of time and there most likely will be stormwater runoff quality problems. The County may want to investigate one additional pond (or other treatment methods) location for stormwater runoff quality treatment purposes. A possible location would be on the east side of Cottonwood Road across from Canberra Drive. This location could be utilized to treat the flows from the 48-inch diameter storm drain prior to release into Russell Creek. The outlet can be configured such that this pond would function mainly as an infiltration basin for small storm events and would bypass large storm events. The location would have to be further investigated for conflicts with existing features and eventually property would have to be acquired if this consideration was implemented. There will be ongoing maintenance required for the water quality treatment pond that includes removing silt every year and after large storm events. As an alternative to installing a pond, more compact systems are available for treatment including the Stormceptor by CSR, Vortechnics by Contech, Stormwater 360 by Contect, etc. The advantage of a more compact system is that they require less space for installation. The disadvantage is they may cost more initially and have a more rigid maintenance requirement to adequately function.

Independent of the above listed options and considerations, Cottonwood Road is currently scheduled to be widened including curb and gutter with multiple phases. With the addition of curb and gutter, catch basins will need to be installed. The catch basins should have drywells with overflow pipes connected to the 48-inch diameter pipe. The drywells would be designed to treat and contain smaller storm events and overflow into the pipe for larger storm events. Drywells may not be feasible on the north section of Cottonwood Road due to high groundwater. In those locations the catch basins may need

to be connected directly to the overflow pipe. The existing pipe currently discharges into the east ditch line near Eagle Crest Drive. Downstream drainage improvements, as a part of the Cottonwood Road project, will be necessary in order to convey the runoff from the existing end of the pipe to Russell Creek.

CONCLUSIONS

It is our opinion that Option 4A, with the extended large diameter pipe and a new stormwater pond at the northwest corner of the Cottonwood Road and Kendall Road intersection, impacts the least amount of properties and improves the routing, storage, and treatment of future large storm events. It also presents the least risk to the houses in the Tablerock developments. This option, as with all the options, will involve establishing design concepts and requirements for developments within the drainage areas. Stormwater runoff from the future developments will have to be kept at or below current runoff rates.

I hope this report assists the County in making a decision that will help route, detain, and treat small and large storm events for the Cottonwood Road vicinity. We look forward to meeting with you and discussing the situation and options.

Sincerely,

ANDERSON·PERRY & ASSOCIATES, INC.

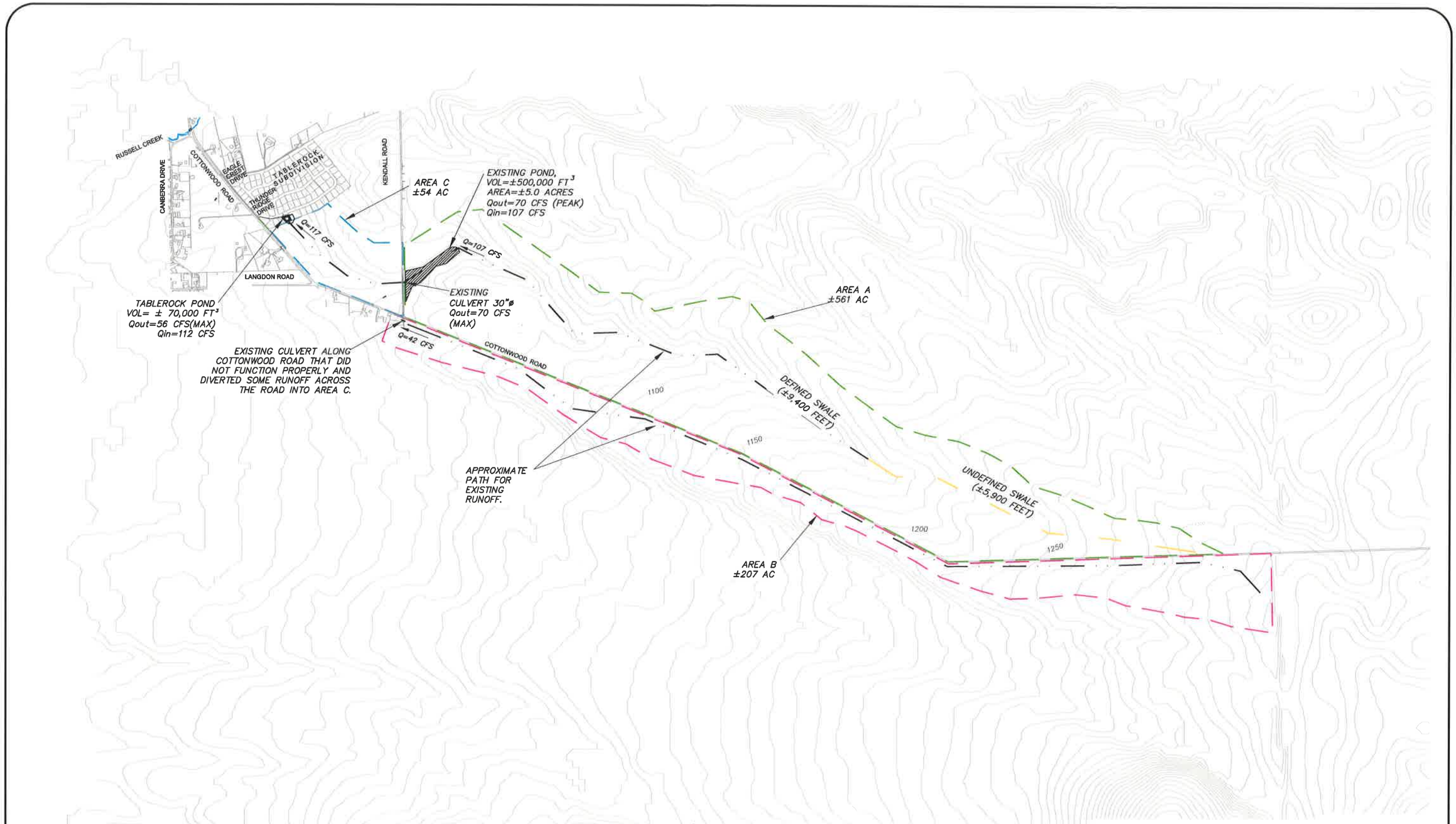
By
Jeremy D. Morris, P.E.

JDM:amw

Attachments

cc: Howard Boggs, Anderson·Perry, w/attach
File W394-97-01, w/attach

S:\DOCS\WW COUNTY\W394-97 COTTONWOOD STORM DRAIN DES\ROUT AND DET ANAL LTR.doc



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WALLA WALLA COUNTY
COTTONWOOD ROAD STORM DRAIN ANALYSIS
TRIBUTARY DRAINAGE AREAS
EXISTING CONDITIONS FOR 100 YEAR–24 HOUR STORM EVENT

FIGURE
1

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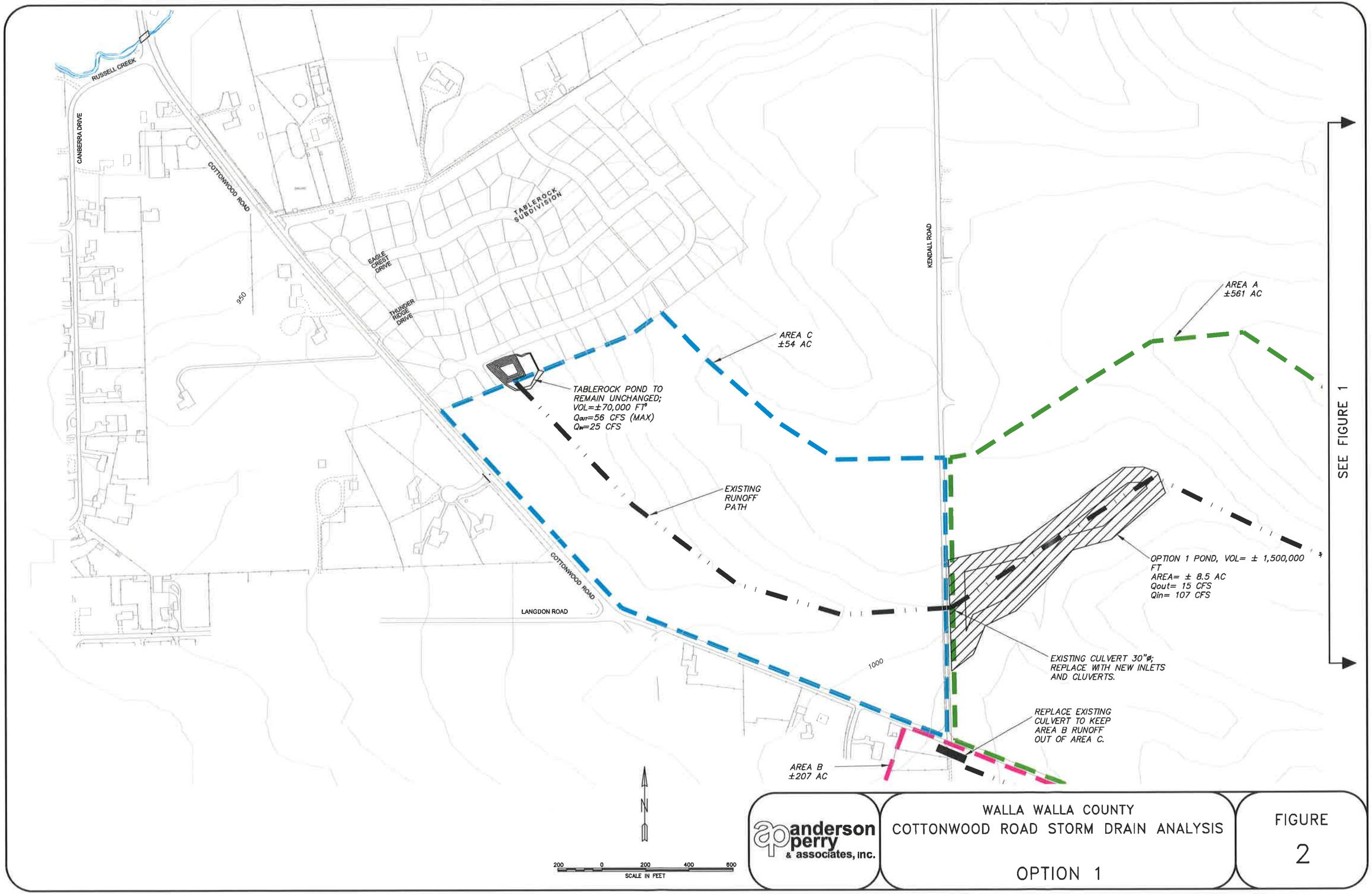

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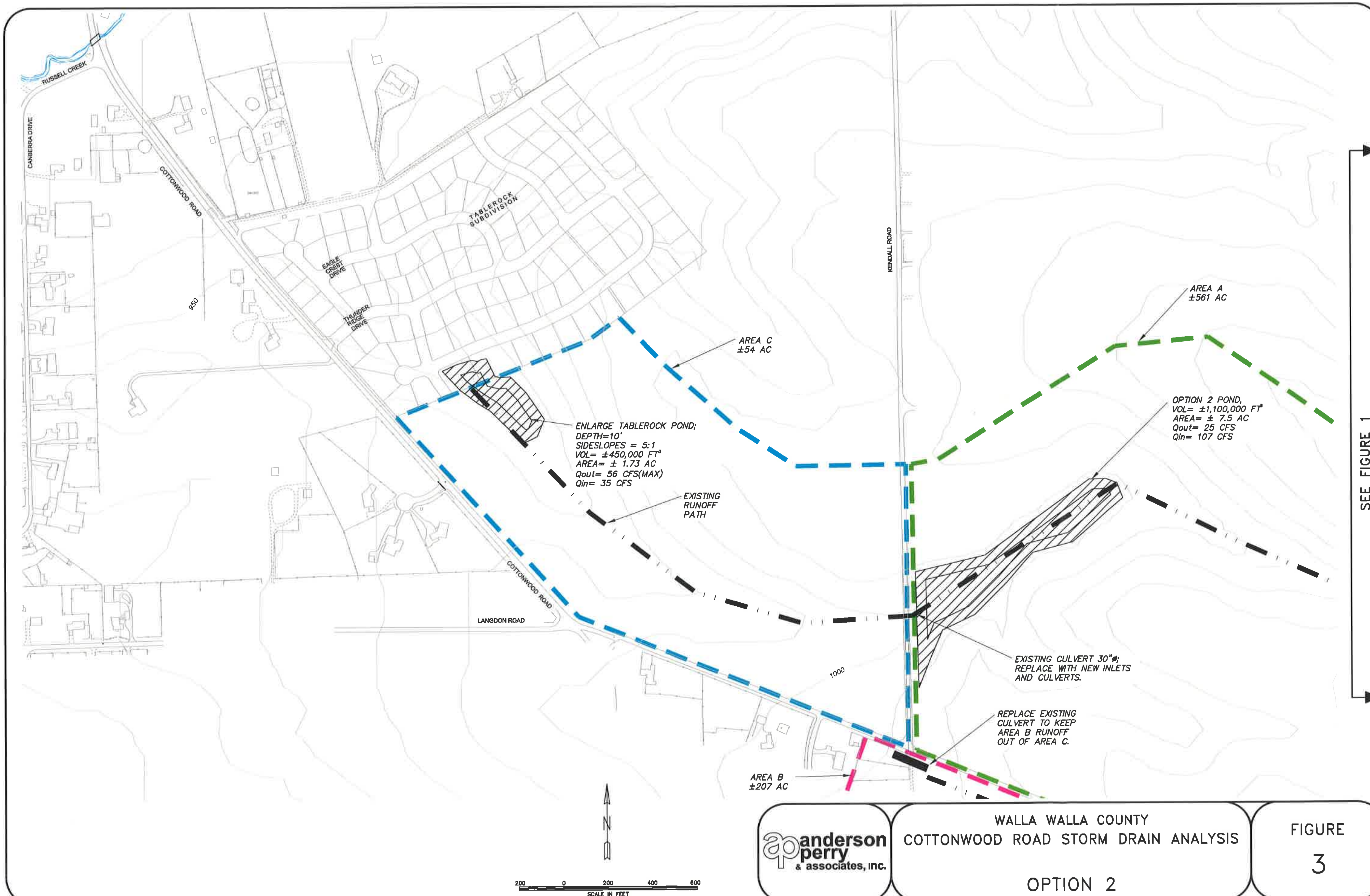

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WALLA WALLA COUNTY
COTTONWOOD ROAD STORM DRAIN ANALYSIS

OPTION 2

FIGURE 3

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RUSSELL CREEK
CANBERRA DRIVE
COTTONWOOD ROAD
950
TABLEROCK SUBDIVISION
EAGLE CREST DRIVE
THUNDER RIDGE DRIVE
KENDALL ROAD
AREA C
±54 AC
TABLEROCK POND TO REMAIN UNCHANGED;
VOL=±70,000 FT³
Qout=56 CFS (MAX)
QIN=45 CFS
AREA A
±561 AC
OPTION 3 POND,
VOL= ± 850,000 FT³
AREA= ± 6.5 AC
Qout= 35 CFS
Qin= 107 CFS
EXISTING RUNOFF PATH
OPTION 3 POND,
VOL= ± 750,00 FT³
AREA= ± 5.5 AC
Qout= 45 CFS
Qin= 87 CFS
COTTONWOOD ROAD
LANGDON ROAD
1000
EXISTING CULVERT 30"ø; REPLACE WITH 21"ø CULVERT WITH AN ADDITIONAL OVERFLOW PIPE NEAR THE SURFACE OF THE ROAD.
REPLACE EXISTING CULVERT TO KEEP AREA B RUNOFF OUT OF AREA C.
AREA B
±207 AC
SEE FIGURE 1
N
200 0 200 400 600
SCALE IN FEET

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WALLA WALLA COUNTY
COTTONWOOD ROAD STORM DRAIN ANALYSIS

OPTION 3

FIGURE
4

RUSSELL CREEK

CANBERRA DRIVE

COTTONWOOD ROAD

950

TABLEROCK SUBDIVISION

EAGLE CREST DRIVE

THUNDER RIDGE DRIVE

KENDALL ROAD

AREA C
±54 AC

TABLEROCK POND TO REMAIN UNCHANGED;
VOL=±70,000 FT
Q_{OUT}=56 CFS (MAX)
Q_{IN}=45 CFS

AREA A
±561 AC

SEE FIGURE 1

EXISTING RUNOFF PATH

OUTLET FOR NEW POND WILL BE INTO THE EXISTING SWALE.

OPTION 4 POND # 2,
VOL= ± 1,150,000 FT
AREA= ± 3.5 AC
DEPTH= 12 FEET
Qout= 35 CFS
Qin= 112 CFS

COTTONWOOD ROAD

LANGDON ROAD

EXISTING POND,
VOL= ± 500,00 FT
AREA= ± 5.0 AC
Qout= 70 CFS (MAX EXISTING)
Qin= 107 CFS

EXISTING CULVERT 30"ø TO REMAIN.

CULVERT(S) TO DIRECT AREA B, INTO NEW DRAINAGE FACILITIES.

AREA B
±207 AC

N

200 0 200 400 600
SCALE IN FEET

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WALLA WALLA COUNTY
COTTONWOOD ROAD STORM DRAIN ANALYSIS

OPTION 4

FIGURE
5

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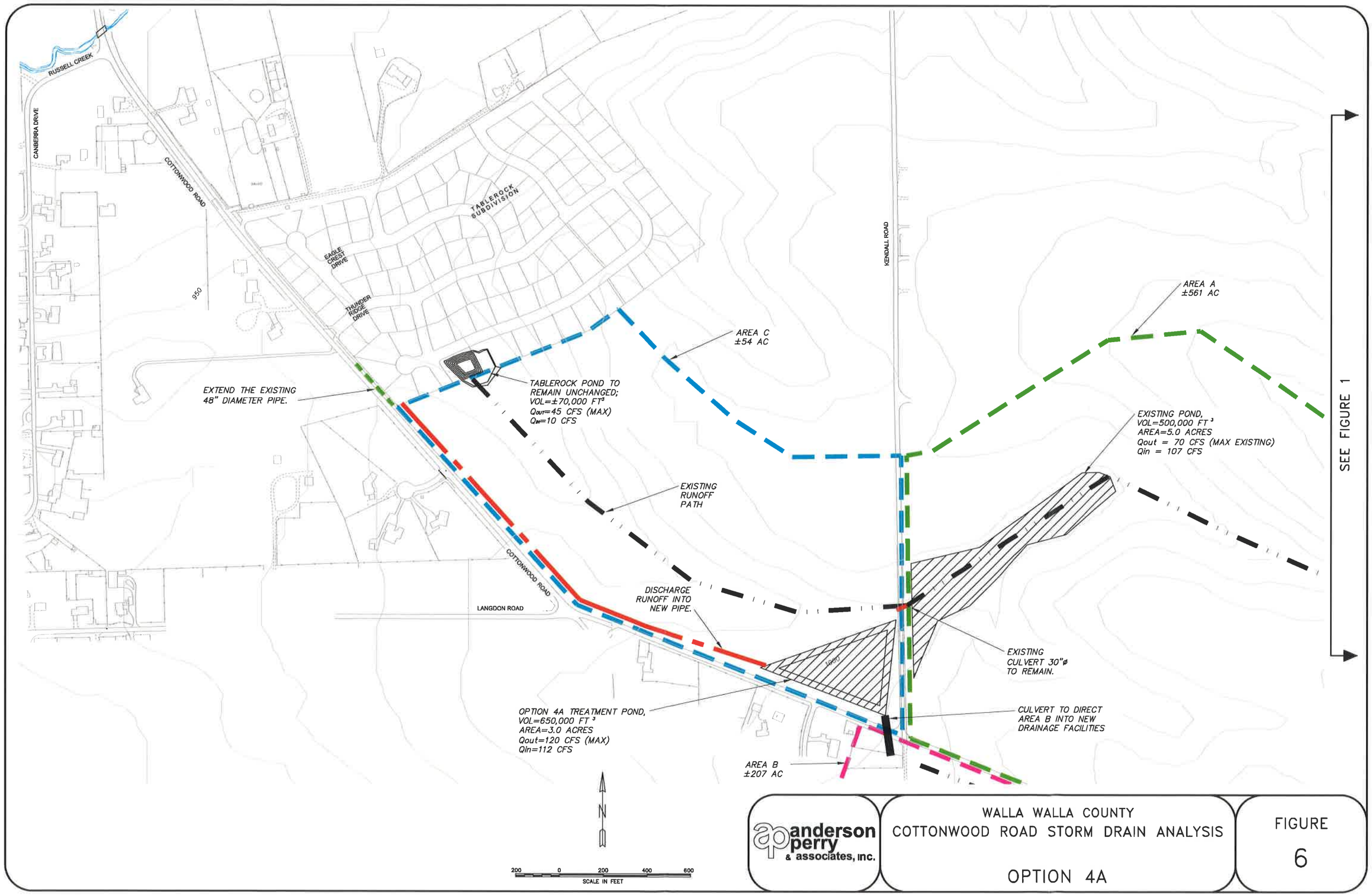

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WALLA WALLA COUNTY
COTTONWOOD ROAD STORM DRAIN ANALYSIS

OPTION 4A

FIGURE
6

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