Gray & Osborne, Inc.
CONSULTING ENGINEERS

MEMORANDUM

TO:	KELLY RASMUSSEN, PUBLIC WORKS DIRECTOR
FROM:	MIKE JOHNSON, P.E. KERRI SIDEBOTTOM, P.E.
DATE:	DECEMBER 5, 2018
SUBJECT:	DOWNTOWN DRAINAGE IMPROVEMENT ALTERNATIVES CITY OF KALAMA, COWLITZ COUNTY, WASHINGTON G&O #18223.00

BACKGROUND

Per our discussions with you and members of the downtown business community, Gray & Osborne has evaluated the runoff from areas tributary to the downtown core in the vicinity of North 1st Street from Holly Street to Geranium Street. The City has experienced several localized flooding episodes in this area over the last couple of years. Recently collected survey information and video inspection logs were used to confirm pipe types, sizes, and slopes for the existing stormwater infrastructure. The stormwater infrastructure in this area is shown on Figure 1.

EVALUATION OF EXISTING FACILITIES

The existing stormwater system in the alley east of North 1st Street between Holly Street and Fir Street currently consists of shallow 6- and 8-inch-diameter concrete pipes, some with slopes of less than 1 percent. One pipe segment has an adverse grade. From the low point behind the old gas station to the downstream connection at Geranium Street, the difference in invert elevations is approximately 0.64 foot over a distance of 260 feet. This results in an available overall slope of approximately 0.2 percent. There is also an existing 4-inch-diameter pipe that connects this system to the west on North 1st Street near the old gas station at 334 North 1st Street.

To evaluate the capacity of the existing stormwater facilities, runoff that would be generated from a 25-year storm event was modeled using the Santa Barbara Urban Hydrograph (SBUH) method. The 25-year storm event is commonly used to size stormwater conveyance facilities, assuming no surcharging within the pipes. The 25-year flow tributary to this area from the uphill basin is estimated to be 5.45 cfs. This includes approximately 2.17 cfs of runoff from upslope of North 2nd Street that discharges down

the slope behind the Kalama Telephone Company. The existing stormwater pipe system on the east side of North 1st Street does not have adequate capacity to handle the estimated 25-year flow.

ALTERNATIVE EVALUATION

We identified several alternatives to potentially resolve this capacity issue. These alternatives include the following as shown on Figure 1:

- Option A – Replace Stormwater Pipes in the Alley East of North 1st Street
- Option B – Extend Stormwater Pipe Down North 2nd Street to Fir Street
- Option C – Replace Stormwater Pipe West to North 1st Street

Descriptions of each alternative follow.

Option A – Replace Stormwater Pipes in the Alley East of North 1st Street

Option A involves replacing approximately 410 linear feet of existing stormwater pipes in the alley east of North 1st Street and on Geranium Street west to North 1st Street. In order to convey the full 25-year storm runoff of 5.45 cfs, a 16-inch-diameter pipe would be required at a slope of 0.51 percent. If flow can be diverted upstream of the system (as in Option B, below), a 12-inch-diameter pipe at a slope of 0.67 percent could convey up to 2.9 cfs of flow instead. Replacing the existing pipes with larger-diameter pipes would also improve capacity for smaller events. The downstream pipe in this section that connects to the system on Geranium Street is laid at an adverse slope, which may be causing upstream flooding. Several other pipes are laid at slopes of less than 1 percent. If the system is replaced to provide a consistent slope, drainage will be improved in this area.

One challenge with this alternative is that there is a significant amount of buried telecommunications infrastructure in this area that will likely reduce production rates and increase costs. The alternative has been developed to connect to the existing 12-inch-diameter pipe along Geranium Street just to the east of the North 1st Street sidewalk so that disturbance within the North 1st Street right-of-way can be avoided. The 12-inch pipe has capacity for 4.5 cfs, which is less than the 25-year event, so the remaining section of 12-inch pipe may be a bottleneck during runoff events comparable to or more intense than the 25-year event.

Due to the shallow depth of these stormwater lines, ductile iron pipe has been assumed for a portion of the project. The estimated cost of replacing this segment with 8- to 16-inch pipes is $180,000 including sales tax, engineering and construction management,

and 20 percent contingency. The estimated cost of replacing this segment with 8- to 12-inch pipes is $162,000 including sales tax, engineering and construction management, and 20 percent contingency.

Option B – Extend Stormwater Pipe Down North 2nd Street to Fir Street

Option B would include the installation of approximately 570 linear feet of 12-inch storm main along North 2nd Street from 320 North 2nd Street to Fir Street. This new pipe would convey water that currently discharges over the hill behind the Kalama Telephone Company and instead discharge it to the Fir Street stormwater system. In the 25-year storm event, approximately 2.17 cfs would be diverted to this pipe. The topography of North 2nd Street slopes approximately 10 percent down to Fir Street so there is adequate slope to convey the required flow.

Currently, the 25-year runoff rate to the Fir Street system is estimated at 5.52 cfs. The additional 2.17 cfs of runoff from North 2nd Street would require 7.69 cfs of capacity. The storm system along Fir Street between North 2nd Street and North 1st Street has a capacity ranging from 9.2 to 14.8 cfs so it has adequate capacity to convey the projected 25-year tributary flow and the North 2nd Street flow. The pipe segment between the intersection of North 1st Street and Fir Street and the Kalama River outfall may be slightly undersized for the total tributary flow. However, the runoff that would be collected by the North 2nd Street diversion currently discharges via the same outfall pipe, so runoff rates to the outfall pipe will not be increased with this option. The estimated cost of constructing this option is $170,000 including sales tax, engineering and construction management, and 20 percent contingency.

The Elm Street system was also considered as a connection point for the North 2nd Street diversion pipe; however, the pipes in this area have less capacity than the pipes along Fir Street. Furthermore, extension to Elm Street would also require approximately 350 feet of additional pipe.

Option C – Replace New Stormwater Pipe West to North 1st Street

This option would construct approximately 170 linear feet of 12-inch-diameter storm pipe from the stormwater system in the alley east of North 1st Street to North 1st Street through the old gas station property. A new easement would likely be required. Due to the shallow depth of this stormwater line, ductile iron pipe has been assumed. The estimated cost of replacing this segment is $100,000 including sales tax, engineering and construction management, and 20 percent contingency. However, the existing 12-inch-diameter main in North 1st Street between Holly Street and Geranium Street has a nearly flat slope and as such, the main does not have adequate capacity for additional

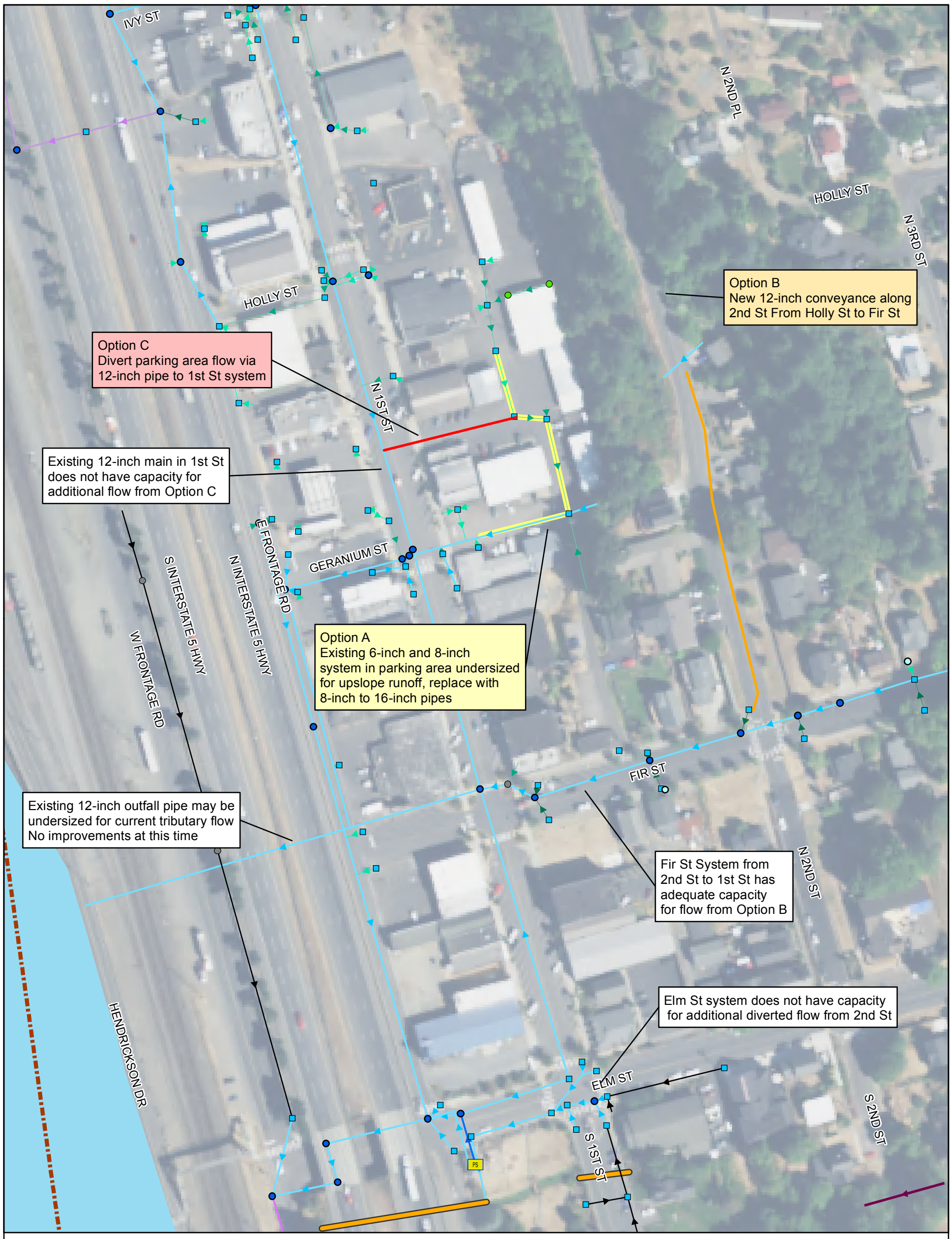
flow. When the Elm Street pump station is operating, there may be some benefit from this connection, but there would not be much benefit under normal gravity conditions.

This option is not recommended due to the capacity deficiency in the downstream pipe on North 1st Street.

RECOMMENDATION

Option A, replacement with 8- and 12-inch pipes, would need to be completed with Option B to fully convey the 25-year storm event. The total estimated cost of this option is $332,000. Option A, replacement with 8- and 16-inch pipes, would also convey the entire 25-year storm event (except a small length of 12-inch pipe to be maintained near the intersection of Geranium Street and North 1st Street) with an estimated cost of $180,000. Option A provides the lowest-cost option for remedying the capacity deficiency in the alley east of North 1st Street. A profile view of the proposed improvement is included as Figure 2.

MBJ/hh
Encl.



Legend

Storm Structures

Type

- Detention Basin
- Inlet
- Area Drain/Cleanout
- Type 2 or 3 CB/Manhole
- Type 1 CB
- Outfall
- Pump Manhole (PS)
- Vault
- Unknown

Storm Pipes

Diameter

- <8-inch Diameter
- 8-inch Diameter
- 10-inch Diameter
- 12-inch Diameter
- 14-inch Diameter
- 15-inch Diameter
- 16-inch Diameter
- 18-inch Diameter
- 21-inch Diameter
- 24-inch Diameter
- 30-inch Diameter
- 36-inch Diameter
- 48-inch Diameter
- Box Culvert
- Unknown Size
- Ditch

- City Limits
- Major Water Bodies

Storm Facilities

- Detention Facility
- Treatment Facility

0 25 50 75 100 200 300 400 500 Feet

N W E S

CITY OF KALAMA

DOWNTOWN DRAINAGE IMPROVEMENTS
FIGURE 1

Gray & Osborne, Inc.
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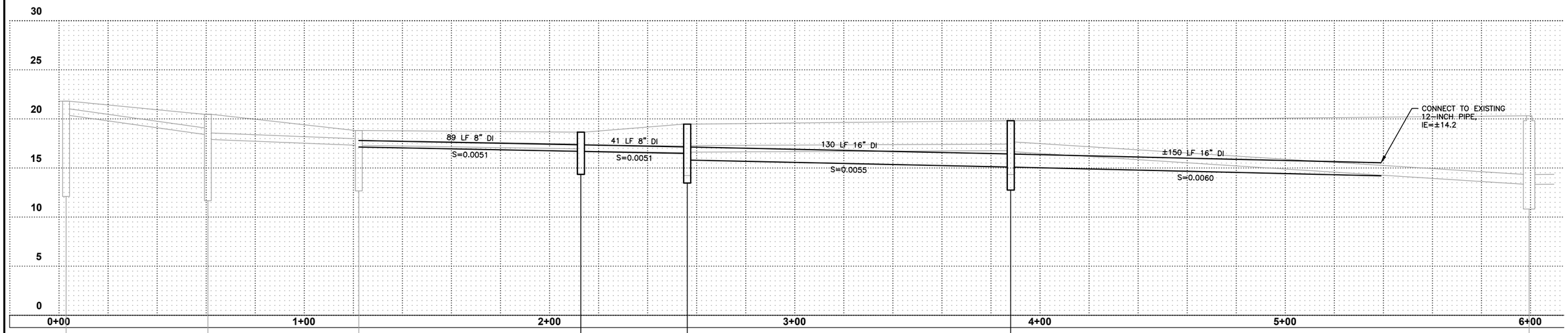
20' 10' 0 20' 40'
SCALE: 1"=20'



CITY OF KALAMA

DOWNTOWN STORM IMPROVEMENTS

OPTION A
PROPOSED PROFILE

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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12/05/2018

City of Kalama
G&O Project # 18223.00
Stormwater Utility Formation Downtown Drainage Improvements
Option A-1: Replace Stormwater Pipes with 12" and 16" Pipe in the Alley East of N. First Street

				Engineer's Estimate	
Item No.	Description	Units	Quantity	Unit Price	Contract Amount
1	Mobilization	LS	1	$ 10,000.00	$ 10,000.00
2	Unexpected Site Changes	LS	1	$ 5,000.00	$ 5,000.00
3	Traffic Control	LS	1	$ 1,600.00	$ 1,600.00
4	Locate Existing Utilities	LS	1	$ 1,000.00	$ 1,000.00
5	Trench Safety Systems	LS	1	$ 5,000.00	$ 5,000.00
6	Unsuitable Materials	CY	120	$ 40.00	$ 4,800.00
7	Temporary Erosion and Sediment Control	LS	1	$ 5,000.00	$ 5,000.00
8	Rock Excavation for Trenches	CY	70	$ 100.00	$ 7,000.00
9	8-Inch Pipe DI	LF	130	$ 80.00	$ 10,400.00
10	12-Inch Pipe DI	LF	-	$ 100.00	$ -
11	16-Inch Pipe DI	LF	130	$ 150.00	$ 19,500.00
12	16-inch Pipe PVC	LF	150	$ 80.00	$ 12,000.00
13	Type 1 Catch Basin	EA	3	$ 2,000.00	$ 6,000.00
14	Temporary Stormwater Bypass	LS	1	$ 5,000.00	$ 5,000.00
15	Connect to Ex. Storm System	EA	2	$ 3,000.00	$ 6,000.00
16	Imported Foundation Gravel (If Required)	TN	30	$ 15.00	$ 450.00
17	Imported Backfill Gravel (If Required)	TN	230	$ 18.00	$ 4,140.00
18	Controlled Density Fill (CDF)	CY	25	$ 100.00	$ 2,500.00
19	Asphalt Trench Patch	TN	50	$ 150.00	$ 7,500.00
20	Sawcutting	LF	840	$ 3.00	$ 2,520.00
21	General Restoration	LS	1	$ 2,000.00	$ 2,000.00

SUBTOTAL	**$ 117,410.00**
20% Contingency	**$ 23,482.00**
25% Engineering & Construction Management	**$ 29,352.50**
Sales Tax, 7.9%	**$ 9,275.39**
TOTAL BID	**$ 180,000.00**

12/05/2018

City of Kalama
G&O Project # 18223.00
Stormwater Utility Formation Downtown Drainage Improvements
Option A-2: Replace Stormwater Pipes with 12" Pipe in the Alley East of N. First Street

				Engineer's Estimate	
Item No.	Description	Units	Quantity	Unit Price	Contract Amount
1	Mobilization	LS	1	$ 9,000.00	$ 9,000.00
2	Unexpected Site Changes	LS	1	$ 5,000.00	$ 5,000.00
3	Traffic Control	LS	1	$ 1,600.00	$ 1,600.00
4	Locate Existing Utilities	LS	1	$ 1,000.00	$ 1,000.00
5	Trench Safety Systems	LS	1	$ 5,000.00	$ 5,000.00
6	Unsuitable Materials	CY	100	$ 40.00	$ 4,000.00
7	Temporary Erosion and Sediment Control	LS	1	$ 5,000.00	$ 5,000.00
8	Rock Excavation for Trenches	CY	60	$ 100.00	$ 6,000.00
9	8-Inch Pipe DI	LF	130	$ 80.00	$ 10,400.00
10	12-Inch Pipe DI	LF	130	$ 100.00	$ 13,000.00
11	12-inch Pipe PVC	LF	150	$ 70.00	$ 10,500.00
12	Type 1 Catch Basin	EA	3	$ 2,000.00	$ 6,000.00
13	Temporary Stormwater Bypass	LS	1	$ 5,000.00	$ 5,000.00
14	Connect to Ex. Storm System	EA	2	$ 3,000.00	$ 6,000.00
15	Imported Foundation Gravel (If Required)	TN	20	$ 15.00	$ 300.00
16	Imported Backfill Gravel (If Required)	TN	190	$ 18.00	$ 3,420.00
17	Controlled Density Fill (CDF)	CY	25	$ 100.00	$ 2,500.00
18	Asphalt Trench Patch	TN	50	$ 150.00	$ 7,500.00
19	Sawcutting	LF	840	$ 3.00	$ 2,520.00
20	General Restoration	LS	1	$ 2,000.00	$ 2,000.00

SUBTOTAL	**$ 105,740.00**
20% Contingency	**$ 21,148.00**
25% Engineering & Construction Management	**$ 26,435.00**
Sales Tax, 7.9%	**$ 8,353.46**
TOTAL BID	**$ 162,000.00**

12/05/2018

City of Kalama
G&O Project # 18223.00
Stormwater Utility Formation Downtown Drainage Improvements
Option B: Second Street Stormwater Pipe from 320 Second St. to Fir St.

				Engineer's Estimate	
Item No.	Description	Units	Quantity	Unit Price	Contract Amount
1	Mobilization	LS	1	$ 10,000.00	$ 10,000.00
2	Unexpected Site Changes	LS	1	$ 5,000.00	$ 5,000.00
3	Traffic Control	LS	1	$ 2,400.00	$ 2,400.00
4	Locate Existing Utilities	LS	1	$ 1,000.00	$ 1,000.00
5	Trench Safety Systems	LS	1	$ 5,000.00	$ 5,000.00
6	Unsuitable Materials	CY	130	$ 40.00	$ 5,200.00
7	Temporary Erosion and Sediment Control	LS	1	$ 5,000.00	$ 5,000.00
8	Rock Excavation for Trenches	CY	60	$ 100.00	$ 6,000.00
9	12-Inch Pipe PVC	LF	570	$ 70.00	$ 39,900.00
10	Type 1 Catch Basin	EA	1	$ 2,000.00	$ 2,000.00
11	Temporary Stormwater Bypass	LS	1	$ 5,000.00	$ 5,000.00
12	Connect to Ex. Storm System	EA	1	$ 3,000.00	$ 3,000.00
13	Imported Foundation Gravel (If Required)	TN	30	$ 15.00	$ 450.00
14	Imported Backfill Gravel (If Required)	TN	220	$ 18.00	$ 3,960.00
15	Controlled Density Fill (CDF)	CY	25	$ 100.00	$ 2,500.00
16	Asphalt Trench Patch	TN	70	$ 150.00	$ 10,500.00
17	Sawcutting	LF	580	$ 3.00	$ 1,740.00
18	General Restoration	LS	1	$ 2,000.00	$ 2,000.00

SUBTOTAL	**$ 110,650.00**
20% Contingency	**$ 22,130.00**
25% Engineering & Construction Management	**$ 27,662.50**
Sales Tax, 7.9%	**$ 8,741.35**
TOTAL BID	**$ 170,000.00**

12/05/2018

City of Kalama
G&O Project # 18223.00
Stormwater Utility Formation Downtown Drainage Improvements
Option C: Parking Area to First St.

				Engineer's Estimate	
Item No.	Description	Units	Quantity	Unit Price	Contract Amount
1	Mobilization	LS	1	$ 6,000.00	$ 6,000.00
2	Unexpected Site Changes	LS	1	$ 5,000.00	$ 5,000.00
3	Traffic Control	LS	1	$ 800.00	$ 800.00
4	Locate Existing Utilities	LS	1	$ 1,000.00	$ 1,000.00
5	Trench Safety Systems	LS	1	$ 5,000.00	$ 5,000.00
6	Unsuitable Materials	CY	50	$ 40.00	$ 2,000.00
7	Temporary Erosion and Sediment Control	LS	1	$ 5,000.00	$ 5,000.00
8	Rock Excavation for Trenches	CY	20	$ 100.00	$ 2,000.00
9	12-Inch Pipe DI	LF	180	$ 100.00	$ 18,000.00
10	Type 1 Catch Basin	EA	1	$ 2,000.00	$ 2,000.00
11	Temporary Stormwater Bypass	LS	1	$ 5,000.00	$ 5,000.00
12	Connect to Ex. Storm System	EA	1	$ 3,000.00	$ 3,000.00
13	Imported Foundation Gravel (If Required)	TN	10	$ 15.00	$ 150.00
14	Imported Backfill Gravel (If Required)	TN	70	$ 18.00	$ 1,260.00
15	Controlled Density Fill (CDF)	CY	25	$ 100.00	$ 2,500.00
16	Asphalt Trench Patch	TN	20	$ 150.00	$ 3,000.00
17	Sawcutting	LF	370	$ 3.00	$ 1,110.00
18	General Restoration	LS	1	$ 2,000.00	$ 2,000.00

SUBTOTAL	**$ 64,820.00**
20% Contingency	**$ 12,964.00**
25% Engineering & Construction Management	**$ 16,205.00**
Sales Tax, 7.9%	**$ 5,120.78**
TOTAL BID	**$ 100,000.00**