NapaSan

GHD - TASK ORDER No. 65
Collection System Master Plan (CIP #19727)

Date: _____

Issued under Professional Services Agreement dated August 9, 2017.

To: GHD

Project Description:

Professional Engineering Services

Description of Scope of Services to be performed by Consultant under this Task Order:

See Attachment 'A' – Scope of Services

Description of Services to be Provided by District:	See Attachment 'A' – Scope of Services
Deliverables:	See Attachment 'A' – Scope of Services
Consultant Project Manager:	Matt Winkelman, PE
Consultant Quality Control Manager:	David Kerr, PE
Schedule to Perform Services:	See Attachment 'A' – Project Schedule
Time & Materials Not-to-Exceed Cost Limit:	$410,608 See Attachment 'B' – Project Fee Estimating Sheet

APPROVALS:

GHD

By: _____ _____
Authorized Representative Date

NAPA SANITATION DISTRICT

By: _____ _____
Purchasing Agent Date

NSD Account No.: CIP 19727

ATTACHMENT “A”

July 25, 2018

2018-19 Collection System Master Plan

This scope of services is for the preparation of the first of two Task Orders as part of a comprehensive Collection System Master Plan (CSMP). The CSMP effort includes evaluation of the benefits and costs associated with various project types, including infiltration and inflow (I/I) reduction, capacity modifications, and improvements related to condition, efficiency, risk, and level of service. GHD intends to deliver the project under two task orders. Task Order #1 (TO #1) includes an in depth hydraulic analysis of the 66-inch trunk sewer and is the basis for this scope. Task Order #2 (TO #2) will involve building an all pipes dynamic model and leveraging various data to evaluate the entire network as part of a Tactical Asset Management Plan (TAMP) and will be described in a separate scope of services.

Project Understanding and Approach

The Napa Sanitation District (NapaSan) owns and operates critical infrastructure serving the City of Napa and surrounding areas of Napa County with wastewater conveyance, treatment, water reuse, and discharge services. GHD recommends developing the CSMP based on the principles of NapaSan’s Asset Management (AM) Framework. The objective will be to compete the master planning process in a way that is consistent with the AM Framework that will result in asset data and management strategies that can inform decision support system (DSS) analysis and on-going asset planning over time.

The previous CSMP was completed in 2007. Changes in dry-weather flow, construction of I/I projects, intensification of storm events, and changes in growth projections prompted NapaSan to consider an updated CSMP, for 2019. NapaSan’s 66-inch Trunk Sewer Rehabilitation Project is currently addressing corrosion and structural issues within one of its most critical assets. The expedition and execution of an updated CSMP provides the key added benefit of guiding NapaSan in determining and validating key design decisions on that project.

GHD proposes to employ a holistic approach to both phases of this master plan, utilizing advanced GIS-centric modeling software in conjunction with GIS-centric asset prioritization software that seamlessly integrates with NapaSan’s Computerized Maintenance Management System (CMMS) to deliver a comprehensive solution.

Basic Scope of Services for Task Order #1 – Hydraulic Capacity Analysis for 66-inch Trunk

The professional engineering services for the Project are provided below.

Task 1 – Project Management and Coordination

Task 1.1 Internal Coordination and Administration

Provide project management services during the project. The following summarizes our project management activities:

- Project staffing requirements. Evaluate and assign staff as needed to meet project quality and schedule requirements.
- Project progress. Evaluate and track progress on scope, schedule, and budget. Prepare monthly project activity reports to be provided with each of our monthly invoices during the project. These reports will provide NapaSan with a brief description of the activities completed during the previous month.
- Project Management Plan. Develop a detailed Project Management Plan for the team to use as a basis for project execution.

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Deliverables: *Project Management Plan; Monthly Progress Reports*

QA/QC review time is incorporated into the various project tasks.

Task 1.2 Project Meetings and Coordination with NapaSan

- Kickoff workshop to be attended by GHD’s project team and V&A’s Project Manager. Topics for discussion at this meeting include modeling needs; preparation for field work; and confirmation of NapaSan’s goals/objectives for the project;
- Existing Model Review Workshop to be attended by GHD’s project team and V&A’s Project Manager. The purpose of this meeting is to review various aspects and assumptions for the existing hydraulic model and identify any changes for the model to be completed under Task Order #1 and #2.
- Conduct monthly progress meetings and weekly progress calls between GHD’s Project Manager, Technical Lead, and NapaSan staff;
- Preparation of meeting notes, as necessary; and
- Miscellaneous coordination with NapaSan for the duration of the scope of work.

Other project meetings related to specific scope tasks are noted elsewhere in the scope of services.

Deliverables: *GHD will prepare meeting agenda, meeting notes (commensurate with the formality of the meeting), and monthly invoice progress reporting (including monthly milestone schedule and budget updates).*

Task 2 – 66-inch Trunk Model Build

To verify the design basis for the 66-inch trunk, GHD will import GIS data from NapaSan’s latest production GIS and conduct a field survey for 66-inch trunk manholes, essentially building the 66-inch trunk model. GHD may rely on the existing InfoSWMM model, which was developed as part of the 2014 Browns Valley Trunk (BVT) Predesign project to help support and validate the new model, but it will not provide the sole basis for the new 66-inch trunk model.

Task 2.1 Production GIS Import and Model Update

GHD will request a copy of NapaSan’s latest production GIS to be used in creating the 66-inch trunk hydraulic model.

V&A and GHD will review flow-monitoring data from the recent past (2015 – Present) and choose the most complete and accurate data for use in the initial dry weather flow (DWF) and wet weather flow (WWF) model runs for the 66-inch trunk model calibration. NapaSan desires to know what impact, if any, the Siphon and 66-inch trunk have on upstream capacity and surcharging issues. NapaSan has shown moderate surcharging from the January 22, 2017 storm in the north central portion of the system at various manholes along the 10- to 20-inch trunk that starts on Oxford Street, south to Redwood Rd, turning east to Solano Ave, south on Solano Ave to Park Ave, turning east again to Jefferson Street, and then south to Hayes Street and Brown Streets. This 20-inch line turns east towards the downtown area and ultimately meets the 48-inch line at the Yahome Street/Pearl Street intersection, which then feeds into the 30-inch Siphon under the Napa River. GHD will extend the model upstream to at least the Trancas Street area, including this 10”-20”-48” line and other major trunks heading north to better understand the relationship between the siphon and 66-inch trunk performance and upstream surcharing. The assumption is that much if not all of the physical BVT model (pipe length, material, inverts, slope, diameter, etc.) for the major trunk lines added as part of the model extension will have been validated as correct per 2014 (BVT

model validation). InfoSWMM’s GIS Gateway tool would find and note where differences occur between the 2014 BVT and current model, and then update with the newer, more correct info where available. Areas where new projects have been built or configurations/changes have occurred will be reflected in this model update.

The model will be truncated at portions of the eastern, western, and northern systems. Therefore, V&A will generate external inflow files based on the chosen calibration period for the connection points to the eastern, western, and northern systems. The BVT model currently extends west and upstream of the West Napa Pump Station (WNPS), but GHD may choose to trim the model just upstream of the WNPS and if so will utilize an inflow file there as well. For areas along the modeled trunks that contribute flow to the system but not handled by meter data inflow files, BVT model unit flow values will be scaled appropriately to match current conditions. This may be based on population, specific development projects, or some combination of both so that the scaling matches the localized conditions.

If sufficient and accurate previous flow metering provides adequate inflow file representation then the model will be run prior to the 2018/2019 wet weather season flow monitoring program. If not, GHD will wait and run as soon as the early season data is processed and available The WWF model will then be calibrated to an actual storm from the 2018/2019 wet weather season, and if desired, the model run with NapaSan’s chosen design storm (10 yr – 24 hour) as well. Any further early wet weather season level sensing or flow monitoring on/along the 66-inch trunk will be done to support the verification of the TO #1 model. Calibration for this task involves adjusting physical parameters of the 66-inch trunk and associated lines like roughness, sediment build-up/distribution (essentially internal diameter and pipe shape and slope), and corrosion factors to match flows and levels observed during the 2018/2019 early wet weather season monitoring efforts.

GHD has recent pipe inspection data from nine manholes spanning the 3-mile 66-inch trunk alignment, entered by V&A as a part of the 66-inch trunk condition assessment in 2017. This information will be used prior to the 2018/2019 wet weather season flow data to pre-build an intelligent model to predict true 66-inch trunk performance:

- Hydraulic grade line (HGL) and velocity measurements already suggest some pipe segment sagging. Though the slope was designed constant at 0.004 for most of the alignment, spot measurements confirm an HGL different than designed. GHD will conduct a field survey for the 18 manholes along the 66-inch trunk between the Influent Pump Station (IPS) and WNPS force main connection point to collect rim and invert elevations. Elevations will be used to verify previously-surveyed manholes and to collect data for manholes not previously surveyed. Field survey is anticipated to take one fieldwork day. NapaSan staff may be requested to provide assistance prior to and/or during the field work, including providing access, clearing substantial vegetation (if applicable), and opening manhole lids if locked. Field survey data will be incorporated into the GIS geodatabase.
- Severe corrosion at several locations has caused loss of surface mortar, small and large aggregate past the first mat of reinforcing steel above the high-water line. With the loss of material, there is an increase in pipe diameter above the water line, but also an increased friction factor due to the extremely rough surface, which may be important during peak wet weather flow conditions when the pipe is nearly full. Results from planned pipeline inspection (under a separate NapaSan project) will also be incorporated into the model as that data becomes available.
- There are several inches of sediment build-up at many locations, quite possibly composed of the lost aggregate from the host pipe. The sediment increases drag and decreases available cross-sectional area, decreasing the available capacity.

Many of the above bullet items confirm NapaSan observations and suspicions. Intelligent use of existing knowledge within along the 66-inch trunk on a pipe reach by pipe reach basis will allow for improved comprehension of the minute idiosyncrasies that can affect the HGL for the 66-inch trunk; the 2018/2019 flow data will confirm and fine-tune the accuracy of the hydraulic model.

Task 2.2 Flow and Level Sensor Monitoring

Collection and processing of wet weather flow data is included in this task. The flow monitoring and level sensing plan for the 2018/19 wet weather season combines TO #1 and TO #2 scope requirements with the use of results from 13 years of previous I/I and flow monitoring studies. This information will be discussed at the kickoff meeting along with confirmation of the approach for the 2018/2019 wet weather season. The following provides a summary of the 25 meters, 12 level sensors, and 3 plugs for the 2018/19 wet weather season.

- **TO #1 Meters (Dec ’18 – Feb ’19)**: 15 meters will be placed on or at key nodes feeding the 66-inch trunk, and 12 level sensors placed within the 66-inch trunk. These meter and level sensor data, combined with intelligence from past V&A assessment data on the 66-inch trunk (i.e., corroded and rough surface conditions, line sagging, sediment, etc., refer to TO #1, Task 2.1), will be used to fine-tune the model and provide the most accurate depiction of peak measured and peak modeled flows for the 66-inch trunk.
- **TO #2 Meters (Jan ’19 – Feb ’19)**: The 15 meters and sensors noted above will remain and V&A will install 10 additional meters for master planning and model build-out. GHD will utilize V&A’s unique approach to maximize the efficiency of flow data capture. Flow monitoring data will be analyzed immediately after early-season rain event(s) to determine base flows and I/I responses within respective basins. GHD and V&A will evaluate and discuss with NapaSan the analysis results and then attempt to relocate lower priority flow meters into newly established higher priority locations prior to the next storm event. Flow data may be considered lower priority if the basin has lower relative I/I, has flows and I/I response consistent with past data, or for other master planning, modeling, or NapaSan planning motives. These meters will be repositioned to subdivide and better characterize basins that are showing higher I/I or that need better detail.

TO #1 flow and level monitor data will be used in both task orders and specifically for aspects of the TO #1 final report, while the remaining TO #2 data will be reviewed, utilized and reported in a TO #2 task.

Task 2.3 Reporting and Assessment

GHD will prepare a preliminary model results report that contains visual HGL profiles and thematic plan maps with detailed hydraulic model results. These maps will show d/D, q/Q, capacity restrictions due to throttling and backwater conditions for all of the major areas of concern, including and focusing on, but not limited to the BVT, WNPS, and 66-inch trunk. This task also includes using the current hydraulic model for hydraulic evaluation of various scenarios for the sewer collection system. The scope for which scenarios to evaluate, including sensitivity analysis for each scenario, will be discussed at the Existing Model Review Workshop included in Task 1.

Scenarios to be explored may include but not necessarily be limited to the following:

- Maximizing and/or determining Max Q through the Siphon;
- Maximizing and/or determining Max Q through the 66-inch trunk;
- Evaluating a range of realistic potential I/I reduction in North and West Napa and what affect they have on the Siphon and 66-inch trunk capacities;
- Determining a range of key Q split locations and configurations and what effect they have on upstream capacity as well as Siphon and 66-inch trunk capacities;

- Siphon configurations (closing one side for cleaning; adding additional siphon to test/relieve potential flow throttling);
- Testing possible 66-inch trunk size increases to understand what relief they provide in terms of throttling and upstream backwater effects; and
- Testing the effects of applying a range of design storm sizes, shapes and intensities.

The scenarios could be evaluated and summarized in a matrix to better organize and track the impacts and results.

Task Order #1 Deliverable: 66-inch Trunk Hydraulic Capacity Analysis Report (electronic and hard copies)

Task 3 – As-needed Hydraulic Evaluations

At NapaSan’s request, GHD will use the current hydraulic model to evaluate scenarios for the sewer collection system. Scenarios may include changes in development, sensitivity analysis for land use or wet weather storm events, implementation of I/I reduction program projects, or similar. The budget for this task is assumed to cover the as-needed requests from NapaSan, but may also be used with NapaSan approval to cover additional effort for other project tasks.

Task Order #1 Deliverable: 66-inchTrunk Hydraulic Capacity Analysis Report (electronic and hard copies)

Optional Tasks

Task O.1 Additional 0.5 Month Flow Monitoring

At the direction of NapaSan, which would likely follow a review and discussion of weather conditions affecting the flow monitoring effort, the flow monitoring time period would be extended for an additional half month. The intent for extending the flow monitoring time period is to capture additional data from storm events. Analysis and reporting per Task 2 would also apply to this optional task.

Task O.2 Additional Level Sensors

At the direction of NapaSan, which would likely follow a review and discussion of modeling results prior to deploying flow meters and level sensors in Task 2.2, an additional four level sensors would be added to the Task 2.2 scope. The intent for the additional level sensors would be to capture additional data north of the Siphon for hydraulic grade level during storm events.

Project Schedule

Engineering services will commence upon issuance of the Notice to Proceed for this scope of services, which is anticipated to occur on or around August 1, 2018. The Project will begin with a kickoff workshop and project management plan development in August 2018. Timing for flow monitoring is weather-dependent, but anticipated to begin sometime between early and late December 2018. Flow monitoring will last for one to two months. The early season flow and level sensor data (TO#1’s portion) will be utilized in calibrating and running the 66” trunk model and the final hydraulic capacity report may not include later wet season flow and & level data. A full review and analysis of all flow monitoring and level sensor data will be done as part of TO#2. The final hydraulic capacity report for TO#1 will be delivered in March of 2019.

The following provides an approximate schedule for the completion of the scope of services of TO #1:

Table 1 Tentative Task Order #1 Project Schedule

	Task	Completion Date
a.	Notice to Proceed	August 2018
b.	Kickoff Workshop and PMP (Task 1.1)	August 2018
c.	66” Trunk Model Build (Task 2.1)	August 2018 – January 2019
d.	Conduct Flow and Level Sensor Monitoring (Task 2.2)	December 2018 – January/February 2019 *
e.	Prepare Draft 66” Trunk Capacity Report (1 month - Tasks 2.3)	February 2019 *
f.	NapaSan Review (2 weeks) (Task 2.3)	February/March 2019 *
g.	Review Meeting (Task 2.3)	March 2019 *
h.	Prepare Final 66” Trunk Capacity Report (2 weeks – Task 2.3)	March 2019 *

* Timing depends on weather conditions and whether or not the flow-monitoring period was extended from 2.0 months to 2.5 months.

ATTACHMENT "B"

PROJECT FEE ESTIMATING SHEET

Project Name: CSMP Task Order #1 **Client:** NapaSan

Prepared by: C. Brothers **Date:** July 25, 2018

Reviewed by: M. Winkelman

Job Number: 11177278

		LABOR COSTS												FEE COMPUTATION		
Task / Item	LABOR CATEGORY > RATE >	Principal $265 /Hr	QA/QC Manager $170 /Hr	Project Manager $235 /Hr	Technical Lead $195 /Hr	Staff Engineer $145 /Hr	GIS / Hydraulics $170 /Hr	AM Lead $225 /Hr	AM Engr. $175 /Hr	Field Survey $160 /Hr	Tech Writer $140 /Hr	Admin $115 /Hr	TOTAL HOURS	*OTHER DIRECT COSTS	Sub-Consultant V&A	TOTAL FEE
Task 1 - Project Management and Coordination																
1.1 Internal Coordination and Administration		2	2	8	4	2	2					4	24	$144		$4,764
1.2 Project Meetings and Coordination with NapaSan		4		80	66	4	28	4					186	$1,116		$40,086
Subtotal Task 1		**6**	**2**	**88**	**70**	**6**	**30**	**4**	**0**	**0**	**0**	**4**	**210**	**$1,260**	**$0**	**$44,850**
Task 2 - 66-inch Trunk Model Build																
2.1 Production GIS Import and Model Update			8	16	84	44	100			12			264	$2,092		$48,892
2.2 (A) TO #1 Flow Monitoring			4	8	24	8	20						64	$384	$105,320	$117,504
(B) TO #2 Flow Monitoring			4	8	24	8	20						64	$384	$68,192	$80,376
2.3 Reporting and Assessment		6	16	28	96	40	88	4	8		16	8	310	$1,860		$57,690
Subtotal Task 2		**6**	**32**	**60**	**228**	**100**	**228**	**4**	**8**	**12**	**16**	**8**	**702**	**$4,720**	**$173,513**	**$304,463**
Task 3 - As-needed Hydraulic Evaluations																
3.1 As-needed Hydraulic Evaluations			2	16	30	18	40						106	$636		$19,996
Subtotal Task 3		**0**	**2**	**16**	**30**	**18**	**40**	**0**	**0**	**0**	**0**	**0**	**106**	**$636**	**$0**	**$19,996**
PROJECT TOTALS		**12**	**36**	**164**	**328**	**124**	**298**	**8**	**8**	**12**	**16**	**12**	**1,018**	**$6,616**	**$173,513**	**$ 369,309**
Optional Tasks																
O.1 Additional 0.5 Month Flow Monitoring			2	4	16	8	8						38	$228	$27,300	$34,448
O.2 Additional Level Sensors				2	4								6	$36	$5,565	$6,851
Subtotal Optional Tasks		**0**	**2**	**6**	**20**	**8**	**8**	**0**	**0**	**0**	**0**	**0**	**44**	**$264**	**$32,865**	**$41,299**
PROJECT TOTALS (With Optional Tasks)		**12**	**38**	**170**	**348**	**132**	**306**	**8**	**8**	**12**	**16**	**12**	**1,062**	**$ 6,880**	**$ 206,378**	**$ 410,608**

*OTHER DIRECT COSTS include telephone, mileage, printing, photocopies and other miscellaneous direct expenses.