TWELFTH AMENDMENT
TO AGREEMENT

THIS TWELFTH AMENDMENT (the "Twelfth Amendment") to the Continuing Contract for Professional Services is made and entered into **this 14th day of November, 2007** by and between the CITY OF NAPLES, a Florida Municipal Corporation (the "City"), and **Tetra Tech, Inc. - Hartman and Associates, Inc.** (the "Consultant").

W I T N E S S E T H

WHEREAS, the City and the Consultant entered into that certain Continuing **Contract for Professional Services, dated October 1, 2003 (Resolution 03-10207)** (the "Original Agreement") for **public works/treatment plant processes design services** ('Project'); and

WHEREAS, the parties desire to amend the Original Agreement by this Twelfth Amendment **to provide a sewer system evaluation survey on the wastewater collections system.**

NOW, THEREFORE, for good and valuable consideration, the receipt of which is hereby acknowledged, and in consideration of the mutual covenants, promises and conditions herein set forth, it is hereby acknowledged and agreed as follows:

1. The above recitals are true and correct and are incorporated herein by this Reference.

2. "Article Four, Compensation" shall be amended in accordance with Exhibit "A" attached hereto and incorporated herein for the provision of additional fees by the Contractor **in the amount not-to-exceed $88,895 to provide a sewer system evaluation survey on the wastewater collections system ('Project').**

3. The terms of this twelfth Amendment shall control and take precedence over any and all terms, provisions and conditions of Original Agreement which might vary, contradict or otherwise be inconsistent with the terms and conditions hereof. All of the other terms, provisions and conditions of Original Agreement, except as expressly amended and modified by this Twelfth Amendment, shall remain unchanged and are hereby ratified and confirmed and shall remain in full force and effect.

4. This Twelfth Amendment may be executed in any number of counterparts, each of which shall be deemed to be an original as against any part whose signature appears thereon and all of which shall together constitute one and the same instrument.

IN WITNESS WHEREOF, the City and the Consultant have caused this Twelfth Amendment to be duly executed by their duly authorized officers, all as of the day and year first above written.

CITY:

ATTEST:

CITY OF NAPLES, FLORIDA

By:______________________________
Tara Norman, City Clerk

By:______________________________
City Manager

Approved as to form and legal sufficiency:

By:__________________________________
Robert D. Pritt, City Attorney

Tetra Tech, Inc. - Hartman and Associates, Inc.

____
Witness

By:____________________________

Name:__________________________

Title:___________________________

Revised 05/30/03

TETRA TECH

October 23, 2007

Bob Middleton, Utilities Director
City of Naples
380 Riverside Circle
Naples, FL 34102

Subject: Proposal for City of Naples Wastewater Sewer System Evaluation Survey (SSES) – Phase I (Infiltration and Inflow Analysis)

Tt#200-08516-08001/File 10.0

Dear Mr. Middleton:

Tetra Tech, Inc. (Tt) is pleased to offer this proposal for evaluation of the City's wastewater collection system through performance of Phase I of a wastewater collection system Sewer System Evaluation Survey (SSES). To be successful a SSES needs to be performed in three (3) phases, which consist of the following:

- Phase I – Infiltration and Inflow Analysis
- Phase II – Manhole Inspections/Smoke Testing
- Phase III – Television Inspection

Phase I (Infiltration and Inflow Analysis) as proposed herein will be performed as the initial step in the SSES. The results of this analysis will tell the City which areas require further studying for the remaining phases of the testing program. The goal of Phase I will be to reduce the study area for the remaining phases from the entire system to only a portion of the system. Once the full SSES has been performed, recommendations for corrective measures can be made.

Project Overview

The City of Naples provides wastewater service to its customers throughout the City's service area. The service area basically follows the City limits, but does include some areas outside of the City limits. Wastewater is collected by a series of gravity collection systems; transferred to locally placed lift stations; and pumped to the City's 10.0 MGD wastewater treatment plant (WWTP) for treatment.

The wastewater collection system consists of approximately 125 miles of pipe, ranging in size from 8 to 10 inches in diameter and approximately 3,000 manholes. Over the past

4415 Metro Parkway, Suite 320 Fort Myers, FL 33916
Tel 239.277.5155 Fax 239.277.5189 www.tetratech.com

few years, the City has experienced a gradual increase in inflow and infiltration (I/I) during the wet periods of the year when the water table is at its highest. Due to the proximity to the coast, this has also allowed the introduction of chlorides into the system. As the wastewater treatment process does not remove chlorides, the chlorides are passed through the treatment system and ultimately released into the reuse system. Due to the gradual increase in the chloride levels, the reuse customers have concerns that the high chloride water will damage or kill their grass and vegetation.

In an effort to address the introduction of chlorides into the wastewater system, and the overall increasing I/I levels, the City has performed television surveys and they are currently in the process of slip-lining sewer laterals. However, with the initiation of the Phase I Reclaimed Water System, which is ready to be placed into service, the City desires to perform a more thorough study of the wastewater collection system to better identify the causes and problem areas such that proper corrective measures can be implemented.

Scope of Services

A description of Phase I (Infiltration and Inflow Analysis) of the Sewer System Evaluation Survey (SSES) and the associated scope of services are provided below.

Phase I: Infiltration & Inflow (I/I) Analysis

The I/I analysis should be considered a study of limited scope to determine if infiltration/inflow is excessive within a given sewer collection system. The investigation should identify the presence, flow rate, and type of infiltration/inflow conditions which exist in the sewer system. The following steps will be taken as part of the I/I analysis:

1. Inventory of Existing Conditions

The purpose of the inventory of existing conditions is to provide a better understanding of the sewer system. The following inventory sources will be reviewed:

- Past engineering studies;
- Detailed maps of the wastewater and storm sewer systems;
- Maintenance records kept by the City;
- Water quality information gathered from the lift stations;
- Flow records for the treatment facility and wastewater lift station(s); and,
- Historical USGS/SFWMD/City groundwater data (groundwater levels and quality).

Based on the review of above noted sources, it is possible to establish:

- The type of collection system (combined or separate);
- How often overflows, bypasses, and surcharges occur within the system;
- Type and age of sewer lines and manholes;
- Condition and age of the existing facilities; and,
- Identification of problem areas.

The inventory of conditions should also include a physical survey of the sewer collection system. The purpose the physical survey is to isolate I/I problem areas, select flow gauging areas, and provide a general assessment of the physical condition of the sewer collection system. At a minimum, the following tasks are to be completed during the inventory of existing conditions:

- The limited inspection of a representative number of manholes (10% of the total number of manholes within the system). This will help verify sewer system configurations.
- Selection of continuous and instantaneous gauging stations at the selected manholes.
- Determination of gauging area boundaries for flow continuous and instantaneous gauging areas.
- Selection of water conductivity monitoring locations at manholes (evidenced by wet rings and/or leaks noted during the limited manhole inspections.
- Selection of rain gauge station locations.
- Identify various manufacturers of equipment for continuous monitoring and logging of flow, conductivity, and rainfall.
- Estimated cost of equipment for the City to purchase or rent.
- Monitor stations for 90 days and City sends data to Tetra Tech for analysis.

The City will select, acquire and install the monitoring equipment in selected suspected areas. Tt will assist the City with equipment selection.

2. Initial Flow Monitoring

Flow in sanitary sewer systems consists of three (3) components: base sanitary flow, infiltration, and inflow. Separation of these components is necessary to determine the extent of the problem and to establish the more critical problem areas. Initial flow monitoring will assist in determining the overall system flow quantities and infiltration trends during high and low groundwater periods and for rainfall related inflow during wet weather. At least 70% of the total flow is recommended to be monitored with the least number of flow monitoring devices (one monitor for every 20,000 linear ft (LF) of sanitary sewer line is recommended). This will require thirty (30) flow monitoring devices in order to evaluate the entire sewer system. The monitoring devices will be provided with digital recorders to collect the flow, conductivity, and rainfall data. The information provided by the flow monitoring data will aid in locating those areas with excessive I/I. Continuous metering must be conducted for a minimum of 12 consecutive weeks to determine "peak" infiltration rates (infiltration rates during high groundwater periods). This scope considers the use of temporary continuous flow metering devices which incorporate a velocity sensor combined with a depth sensor. If desired, the use of weirs or flumes can also be used to increase the accuracy of the flow metering program.

To determine infiltration rates, wastewater flow metering data should be examined to identify periods of dry weather (generally three to five days without a rain event). During a dry weather period, nighttime minimum flows represent a period of minimal sanitary flow; therefore, a high percentage of the nighttime flow may be attributed to groundwater infiltration. The portion of the nighttime minimum flow which can be attributed to sanitary flow should be subtracted from the observed flows (engineering judgment should be used to determine sanitary flows).

As tidal infiltration is suspected, a separate analysis should be performed during dry weather periods using nighttime minimum flows corresponding to the tidal cycle.

The recommended data collection equipment will have the ability to make multiple recordings of water level, flow and conductivity such that a near continuous daily recording can be made. With that data, several types of analyses can be made, such as average conductivity, water level and flow; peak conductivity, water level and flow; and the data presented such that problem areas can be identified. This will allow Tt to determine if there are more than one problem areas or areas that have conductivity, water level, or flow problems at different times of the day.

In addition to the installation of flow metering devices within the collection system, lift stations will also be used to monitor flow. Pump run times will be reviewed and compared to the flow measured within the collection system. This will further assist in determining problem areas and further refine the quantities of flow for each component.

3. Rainfall Monitoring

The purpose of the rainfall monitoring is to obtain data to compare variations in gauged flow rates to rainfall intensity, total volume, and duration per event. This information is required to identify inflow rates and its components (direct inflow, delayed inflow, peak inflow rate, and total inflow volume).

Rainfall data must be collected within the area of study. This site specific data is used to develop a rainfall/inflow volume relationship to estimate the inflow volume expected to be produced from the design storm (one year, six hour storm event) in a given subsection of a sewer collection system. Due to the areal extent of the wastewater service area, it is anticipated that a minimum of four automated rain gauges will be recommended for the study in order to record the variability of rainfall events across the service area.

Rainfall data will be collected by standard rainfall devices, such as tipping buckets or continuous rain gauges. The devices will include continuous monitoring accurate to 0.01 inches with digital recorders and totalizers. Data available from the National Oceanic and Atmospheric Administration (NOAA), as well as the Naples Airport will also be reviewed for comparison purposes.

4. Water Quality Monitoring

The purpose of the water quality monitoring is to obtain conductivity data throughout the collection system for relating gauged flow rates and infiltration to wastewater quality. Existing groundwater conditions in the vicinity of the sewer can affect the wastewater quality. Therefore, if significant infiltration is occurring in a particular area that has high chloride concentrations in the ground water, it will lead to higher conductivity in the wastewater flows in those high infiltration areas. As continuous chloride monitoring devices are not available, Tetra Tech proposes that continuous conductivity meters be utilized. The conductivity data will be analyzed and compared to the test results for the chloride sampling results gathered by the City's current testing program. As an increase in chloride concentration is proportional to an increase in conductivity, we will utilize the data to graph the relationship between conductivity and chlorides in this study. In this manner we can determine the ratio of conductivity to chloride concentration and we can use this information to project what chloride levels will be for various levels of conductivity. This will allow us to estimate the change in chloride levels with the continuous conductivity monitoring devices. Similarly, if the City will have samples tested for total dissolved solids (TDS), we can develop a similar relationship between conductivity and TDS concentrations.

Due to the suspected tidal influence in certain portions of the service area and proximity to the coast, it is recommended that the City continue to take samples be taken throughout the collection and pumping system to determine the extent of chlorides within the system and to further allow for a thorough establishment of relationship of conductivity to chloride concentration.

Performing continuous conductivity sampling at various points will further assist in determining if the problem is isolated to a specific area, of if the entire area is subject to high chlorides. As the City has recently been performing chloride testing at each manhole, the selection of suitable conductivity monitoring stations will begin with evaluation of the data gathered. The new conductivity data collected will be compared to the flow monitoring data gathered for the purpose of determine a relationship between the I/I issues and high chlorides, and to further pinpoint problem areas.

5. Flow Data Analysis

Once the above components have been completed, a flow data analysis will be performed for the purpose of categorizing the wastewater flow into its various components; base sanitary flow, infiltration and inflow. The methods for estimating the quantities of the individual components generally consist of the following:

A. Estimating Sanitary Base Flow

The sanitary base flow will be estimated by reviewing the flow meter data gathered under item 2 above, during dry, low water table periods. The estimated infiltration rates as determined below will need to be subtracted to determine the actual estimated base flows. In addition, potable water records can assist in estimating the flows, although the level of accuracy may be low due to the number of variables involved (variations in flow per capita, irrigation usage, number of users per connection, etc).

B. Estimating Infiltration

The infiltration will be estimated by reviewing the flow meter data gathered during dry periods (generally 3 to 5 days without a rain event). During these periods, nighttime minimum flows will be analyzed to estimate the peak, minimum and annual average infiltration rates. The nighttime minimum flow represents a period of minimal sanitary flow; therefore a high percentage of the nighttime flow may be attributed to groundwater infiltration. The portion of nighttime flow that can be attributed to sanitary flow can be estimated by reviewing any commercial businesses which may operate during the night periods, and by engineering judgment of the percentage of nighttime flow that can typically be attributed to sanitary purposes. This amount can be subtracted to determine the infiltration. Peak infiltration rates are typically determined when the groundwater levels are at their highest (during the wet season). Minimum infiltration rates are determined during the driest periods when the groundwater levels are at their lowest. The annual average infiltration rate is determined by analyzing and averaging the data for an entire year.

C. Estimating Inflow

The amount of inflow will be estimated by reviewing the flow meter data in conjunction with rainfall data. Flow meter data for wet periods will be compared to flow meter data during dry periods. The rate and volume of inflow within a given area can be estimated by subtracting the dry weather flow data from the wet weather flow data. Consideration for seasonal population changes must also be made. More specifically, peak inflow rate will be estimated by comparing the hydrograph during 1 hour of a storm event to the hydrograph developed for a dry weather period. The total inflow volume is the area between the storm event hydrograph and the dry weather hydrograph.

The amount of inflow will be estimated for each significant storm event during the flow monitoring period. The total inflow will also be apportioned into direct inflow volume and delayed inflow volume. Direct inflow is the portion of the inflow hydrograph which rapidly increases soon after the storm begins and decreases swiftly upon conclusion of the rain event. Delayed inflow is the portion of the inflow hydrograph that begins at the conclusion of the storm event and gradually decreases until it matches the dry hydrograph conditions.

D. Estimating Tidal Inflow

A separate analysis will be performed to identify and quantify the presence of tidal inflow. During a dry weather period, nighttime minimum flows corresponding to a high tide will be compared to nighttime minimum flows corresponding to a low tide. The difference in flows can be attributed to tidal inflow, tidal infiltration or a combination of both. We will obtain the tide charts for the study period and relate the reported high and low tides to the groundwater elevations recorded at each location.

6. Recommendations for Further Study

Infiltration

After the flow data analysis portion of an I/I analysis has been completed, extensive manhole inspections and flow isolation programs can be recommended for all subsystems exhibiting an infiltration rate equal to or greater than 4,000 gpd/idm (gallon per day per inch diameter per mile of sewer). Further work on subsystems with a lesser rate can be justified on a case by case basis.

Inflow

After the completion of the flow data analysis, the inflow estimated to be produced from the standard one year, six hour design storm must be used to rank all subsystems. The ranking system takes into consideration the following items:

- volume of total inflow;
- volume of direct inflow; and,
- volume of delayed inflow.

The purpose of the ranking system is to evaluate the highest priority subsystems for further inflow studies (i.e., extensive manhole studies, house to house inspections, smoke testing, dye water testing and dye water tracing).

The recommended subsystems must account for at least 80% of the total inflow volume. The 80% rule of thumb should be used as a minimum threshold; however, it is recommended that all subsystems influenced by inflow should be considered for further study.

Schedule

The services described herein will commence upon receipt of a Purchase Order from the City. The study period for this project will be 12 weeks. Prior to commencing the study, Tt will work with City staff to gather existing data, perform field inspections and make recommendations for monitoring locations. It is anticipated that 4 to 6 weeks will be required to perform the initial data collection/inspection work and assist the City in procurement of the necessary monitoring equipment. Following the 12 week study periods, Tt anticipates analyzing the data and submitting a summary report to the City within an additional 4 weeks. If desired by the City, the study period can be extended beyond the 12 week period, as the data will be monitored and collected by automatic equipment which requires little interaction with either Tt or City staff. The entire project duration will be 20 to 22 weeks.

Fees

A breakdown of the project's fees by phase is shown below:

Inventory of Existing Conditions	$23,925.00
Initial Flow Monitoring	11,535.00
Rainfall Monitoring	3,600.00
Water Quality Monitoring	10,420.00
Flow Data Analysis	12,215.00
Recommendation for Further Study	24,200.00
Reimbursable Expenses	3,000.00
Total	**$88,895.00**

The professional fee described above will be billed on a not-to-exceed basis, with invoices submitted monthly based on the percent completion of the various tasks, for the work completed during the preceding month. Reimbursable expenses will be a "not-to-exceed" item and are estimated to be $3,000.00. Reimbursable expenses will be billed monthly with documentation to support the amount requested. The total base fee for this project is $88,895.00. We appreciate the opportunity to provide this proposal and look forward to working with the City on this project. If you have any questions, please give me a call.

Very truly yours,

Tetra Tech, Inc.

Daniel M. Nelson, P.E.
Regional Manager

DMN/200-08516-08001/SCOPE.dmn

Task	Description	Manager VI $235 /hr		Proj Manager II $170 /hr		Hydrogeol ogist VI $130 /hr		Engineer IV $110 /hr		Engineer III $95 /hr		Cadd Drafter II $85 /hr		Administrative Support II $55 /hr		Direct Costs (Equipment)	Total Hours	Total Cost
		Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost	Cost		
1	**Inventory of Existing Conditions**																	
	a) Data Collection (system maps, previous studies, etc)	2	$470	4	$680	0	$0	16	$1,760	16	$1,520	0	$0	2	$110	$0	40	$4,540
	b) Initial Sewer System Inspection		$0	2	$340	0	$0	8	$880	40	$3,800		$0	0	$0	$0	50	$5,020
	c) Analyzing Data to determine overall condition		$0	6	$1,020	0	$0	6	$660	10	$950		$0		$0	$0	22	$2,630
	d) Selection of gauging areas and sewer subsections	2	$470	4	$680	0	$0	4	$440	8	$760		$0	0	$0	$0	18	$2,350
	e) Selection of gauging and conductivity manholes			4	$680	4	$520	8	$880	8	$760					$0	24	$2,840
	f) Selection of rain gauge stations			4	$680	4	$520	2	$220	4	$380					$0	14	$1,800
	g) Equipment evaluation and costing	1	$235	6	$1,020	8	$1,040		$0		$0	0	$0	0	$0	$0	15	$2,295
	h) Initial evaluation of groundwater conditions	2	$470	2	$340	8	$1,040	2	$220	4	$380	0	$0	0	$0	$0	18	$2,450
	Total Hours and Cost This Section	7	$1,645	32	$5,440	24	$3,120	46	$5,060	90	$8,550	-	$0	2	$110	$0	201	$23,925
2	**Initial Flow Monitoring**																	
	a) Selection of monitoring sites and assistance with the first City installation of monitoring devices	0	$0	2	$340	-	$0	4	$440	16	$1,520	-	$0	0	$0	$0	22	$2,300
	b) Periodic review of City collected data		$0	2	$340	-	$0	8	$880	8	$760	-	$0	0	$0	$0	18	$1,980
	c) Analyzing ww flow data to estimate infiltration (30 stations for 90 days)		$0	4	$680	-	$0	16	$1,760	24	$2,280	-	$0	0	$0	$0	44	$4,720
	d) Pump station run time review	1	$235	2	$340	-	$0	4	$440	16	$1,520	-	$0	0	$0	$0	23	$2,535
	Total Hours and Cost This Section	1	$235	10	$1,700	0	$0	32	$3,520	64	$6,080	0	$0	0	$0	$0	107	$11,535
3	**Rainfall Monitoring**																	
	a) Rain gauge installation assistance with the first City installation		$0	1	$170	0	$0	0	$0	8	$760	0	$0	0	$0	$0	9	$930
	b) Rain gauge analysis of City collected data	0	$0	2	$340	0	$0	0	$0	16	$1,520	0	$0	0	$0	$0	18	$1,860
	c) Data collection from NOAA, Airport, for comparison	0	$0	1	$170	2	$260	0	$0	4	$380		$0	0	$0	$0	7	$810
	Total Hours and Cost This Section	0	$0	4	$680	2	$260	0	$0	28	$2,660	0	$0	0	$0	$0	34	$3,600
4	**Water Quality Monitoring**																	
	a) Assistance with chloride testing/evaluation			2	$340			4	$440	20	$1,900						26	$2,680
	b) Selection of monitoring sites and assistance with the first City installation of monitoring devices		$0	2	$340		$0	4	$440	8	$760	0	$0	0	$0	$0	14	$1,540
	c) Periodic review of City collected data	0	$0	2	$340	8	$1,040	0	$0		$0	0	$0	0	$0	$0	10	$1,380
	d) Analyzing conductivity data to estimate infiltration (30 stations for 90 days)			2	$340	8	$1,040		$0	16	$1,520		$0	0	$0	$0	26	$2,900
	e) Developing relationship between conductivity and chloride concentration			2	$340			4	$440	12	$1,140						18	$1,920
	Total Hours and Cost This Section	0	$0	10	$1,700	16	$2,080	12	$1,320	56	$5,320	0	$0	0	$0	$0	94	$10,420
5	**Flow Data Analysis**																	
	a) Base flow estimation	2	$470	2	$340	-	$0	4	$440	16	$1,520	0	$0	0	$0	$0	24	$2,770
	b) Infiltration estimation	2	$470	2	$340	4	$520	4	$440	16	$1,520		$0	0	$0	$0	28	$3,290
	c) Inflow estimation	2	$470	2	$340	4	$520	4	$440	16	$1,520	0	$0	0	$0	$0	28	$3,290
	d) Tidal Inflow estimation	1	$235	2	$340	4	$520	4	$440	14	$1,330	0	$0	0	$0	$0	25	$2,865
	Total Hours and Cost This Section	7	$1,645	8	$1,360	12	$1,560	16	$1,760	62	$5,890	0	$ -	0	$ -	$ -	105	$12,215
6	**Recommendations for Further Study**																	
	a) Determination of problem areas/ranking	2	$470	4	$680	4	$520	10	$1,100	20	$1,900	0	$0	0	$0	$0	40	$4,670
	b) Development of report with recommendations	2	$470	6	$1,020	6	$780	10	$1,100	32	$3,040	24	$2,040	32	$1,760	$0	112	$10,210
	c) Meeting with City to discuss findings	4	$940	4	$680	-	$0	4	$440	6	$570	0	$0	0	$0	$0	18	$2,630
	d) Finalizing recommendation/summary report	2	$470	4	$680	4	$520	6	$660	20	$1,900	16	$1,360	20	$1,100	$0	72	$6,690
	Total Hours and Cost This Section	10	$2,350	18	$3,060	14	$1,820	30	$3,300	78	$7,410	40	$ 3,400	52	$ 2,860	$ -	242	$24,200
	Reimbursables																	$3,000
	Total Cost This Section																	$3,000

TOTAL ENGINEERING FEE FOR THIS PROJECT **$88,895**

Revised 05/30/03