CITY OF WILLITS

111 East Commercial Street, Willits, CA 95490
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August 31, 2015

Matthias St. John
Regional Water Quality Control Board
North Coast Region
5550 Skylane Blvd., Suite A
Santa Rosa, CA 95403

Re: Draft NPDES Permit No. CA0023060, Order No. R1-2015-0029

Dear Mr. St. John,

City staff has reviewed the draft NPDES Permit No. CA0023060, Order No. R1-2015-0029. On review, these are the comments the City would like to submit to the RWQCB prior to the close of the review period:

- The draft permit requires meter calibration either annually or per the manufacturer's recommendations, whichever is most frequent and the City requests that this requirement be removed for the meters measuring flows at INF-001, INF-002, INF-003, EFF-002 and EFF-004. The City of Willits Wastewater Treatment Plant (WWTF) has four existing Siemens Sitrans magnetic flow meters (magmeters) consisting of two at INF-001, one at EFF-002 and one at EFF-004. The City will be installing two new magmeters in order to measure the flows to and from the equalization basins during high flow events. Attached are two memos from MCC Control Systems that address the accuracy of magmeters and the difficulty of field calibrating flow meters in general.

  In a memo dated September 29, 2014 regarding magmeters, MCC writes that "Magmeters are the world wide industry standard and almost above reproach for accuracy and dependability. Given their factory calibration and the need for zero maintenance after installation, installation of such an instrument would provide a great deal of peace of mind for the City." In a memo dated October 3, 2013, MCC states that "flow meters cannot be field calibrated except under extraordinary circumstances. Depending on the type of meter, doing so without the manufacturer's engineering representative present usually voids the warranty as well as any guarantee of accuracy. Open flume flowmeters can have their calibration adjusted more easily that Ultra-sonic or magmeter type meters." These memos are attached as to this letter as supporting documentation, they are labeled as "Memo 1" and "Memo 2" respectively. We would like to request, based on the opinion of our meter calibration expert that we rely on the accuracy of factory installation of our magmeters. These meters will go into an error mode if a problem is detected. If, at any time, the City encounters a problem with one of our magmeters, we will request a loaner meter from the manufacturer and send the meter in for repair. Given the fact that magmeters cannot be calibrated in the field they must be pulled out and sent into the factory for calibration. Logistically speaking, that should only occur if the meter needs repair and a spare can be used in the meantime.

To reiterate, based on MCC's position that flow meters can only be field calibrated under extraordinary circumstances, and their further recommendation of verifying field configuration as a reasonable and attainable annual maintenance activity; we would like to request field configuration verification, rather than calibration at EFF-003. Our request is based on the costs and hours of operator's time associated with sending the meters into the factory for calibration and the disruption it would cause to our continuous flow reading and plant operations. The City proposes annual field configuration verification only be required at EFF-003, which has an open channel meter with a transducer type sensor.

- The City plans to replace the Langemann Gate at EFF-003 with a v-notch weir because it will perform better in the vault location. We would like this to be included in the permit as a future change during the life of the upcoming permit.

- Table Note 1. For Table E-2 Monitoring Station Locations (page E-3) conflicts with the new influent metering plan included with, and described in, the Draft NPDES Permit. The City requests that this note be removed from the document.

- The WWTF produces effluent that meets disinfected secondary-23 standards under Title 22 and some of the UV disinfection requirements in section D. 1. are based on tertiary standards. The City requests that all tertiary disinfection requirements be removed from the permit. (i.e. UV power and turbidity measurements (pg. 12); and weekly calibration against a reference bench top unit (pg. 13))

- Staff wishes to clarify the parcels in which we are permitted to irrigate with recycled water. The map on page C-4 needs modification and a revised map is included with this letter as "Revised C-4 Map". The revised map includes a field to the north of the treatment facility, which is part of APN#108-04-003 (identified on the map). Furthermore, we would like to list all parcel numbers we are permitted to irrigate in the new permit as: APNs 108-04-003, 007-01-001, 108-08-017, 108-07-003, 108-03-006, 108-02-005.

- Under the irrigation requirements (pg. 11, ii.) there is a requirement for "correction within 72 hours of learning [of] runoff, or prior to release of 1,000 gallons; whichever comes first." With our current rate of discharge via irrigation, a 1,000 gallon leak can occur within a matter of seconds. The City would like this modified to simply state within 24 hours, and strike the mention of 72 hours and 1,000 gallons. The rate at which we irrigate makes the 1,000 gpm requirement unachievable. Our current irrigation safety measures for detecting leaks and preventing pipe breaks in the system include PLC set points for high PSI, low PSI, low flow, and high flow. These set points are set to conditions of irrigation needs for the day. If any conditions trigger these set points, the PLC automatically shuts down the irrigation pumps. This will prevent any irrigation water from flowing from the intended application site.

- The City requests that the deadline for the Recycled Water Engineering Report listed in Table E-14 on page E-19 be changed to March 1, 2017. Also, staff noticed the deadline for the Updated Operations & Maintenance Manual in Table E-14 is October 1, 2015 and believe this was intended to be October 1, 2016.

The City thanks the Board for their consideration of our comments and hopes these items will be incorporated in our final permit. The City also wishes to thank RWQCB staff for meeting with City staff to

discuss the draft permit prior to submission of our final comments. The meeting helped to clarify points of concern for City staff and helped to refine our comments.

Sincerely,

Rod Wilburn, P.E.
Public Works Director
City of Willits

CC: Mona Dougherty, P.E., Senior Water Resource Control Engineer
Justin McSmith, Water Resource Control Engineer
Lisa Bernard, Sanitary Engineering Associate
Adrienne Moore, City Manager
JC England, Sewer Plant Operator
File

MEMO 1

MCC CONTROL SYSTEMS
YOUR PARTNER IN AUTOMATION

September 29, 2014

Willits WWTP Parshall Flume Flowmeter Calibration

On September 26, 2014 MCC CS performed calibration services on the Willits WWTP Influent Flowmeter. As all parties are aware, this is an 18" Parshall Flume flowmeter with a Siemens OCM III ultrasonic measurement instrument.

Previous site investigations had brought to light two facts that were cause for concern regarding this instrument's accuracy. First, the transducer head was located too far forward by approximately 3.75". Second, the flowmeter was not registering flow at flume depths under approximately 4 inches. The first issue may possibly have been within an acceptable range of tolerance; there were differing professional opinions on this topic among engineers onsite during a recent visit. However, all of the industry reference literature MCC CS was able to find, as well as all of the Siemen's literature, was insistent that the ultrasonic transducer be located exactly two-thirds of the way along the flume funnel (please refer to the first attached drawing as it explains this better than this paragraph). Some reference material showed this "two-thirds" distance measured along the flume centerline. Other material showed the "two-thirds" distance measured along the hypotenuse of the flume funnel (with the centerline being the base of the triangle, so to speak). As the difference between these layouts worked out to less than an inch, MCC CS split the difference between the two to arrive at a correct location.

While on-site, MCC CS removed the transducer. We cleaned the sensor and also wished to affix it to a test jig where distance measurements could be taken accurately under a controlled enviroment. It should be noted that the OCM III was configured to hold any last 4-20mA output under echo loss conditions, which meant readings to SCADA remained constant while we performed our removal, cleaning, and reinstallation work. During measurement tests SCADA did receive some brief but erroneous flow signals. Flow in the flume itself remained very constant during our time onsite.

The transducer was found to be in good shape and was successfully cleaned. The OCM III's temperature transducer was found to be in good condition and functional as well. While removing the transducer, we found the existing EYS (explosion proof conduit body) had not been packed and sealed. This was concerning as it conceivably allowed sewer gases to migrate up the conduit to the OCM III. This is primarily a concern as a possible source of combustion if methane were to find a spark or heat source. MCC CS sealed the fitting when we were done.

While we had come equipped to remove and replace the existing conduit and transducer mounting, it was found that the transducer mount was loose enough to allow it to be moved. So the transducer was simply relocated to the proper location and the existing hardware was retained. It should be made clear that "loose" meant the assembly could be moved with an 18" Rigid pipe wrench. It was by no means loose enough to move by hand. The end result was that the transducer location was satisfactorily corrected.

MCC CS also measured the actual distance from the bottom of the flume (directly below the transducer face) to the transducer face with a straightedge scale. This was found to be 42 7/8". This measurement was verified upon reinstallation.

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Once the transducer itself was affixed to our test jig, out of the vault and at street level, we found that the transducer/OCM III was indeed not measuring past approximately 38". This was found to be caused by parameters D9 and P45 being mis-set. D9 is Nominal Target Range. This was set to low, resulting in the loss of readings at 38". P45 is Low Flow Cut-Off, in other words, where to begin ignoring readings. This was set at 1.88", which also differed from the recorded setting of 1.5" in the O&M provided to City of Willits and then supplied to MCC CS. The difference in these parameter settings explained why the flowmeter was not "seeing" flow until there was 4' of water in the flume. We adjusted both settings (to 43 and 0 respectively) and found the OCM was then able to see targets out to 43" and measure flume depths down to .25". We ran multiple tests in our jig to confirm the readings before any changes were made to the parameters, during the parameter changes and afterwards. All of this was done in order to be 100% certain the instrument was behaving exactly as desired. All tests reflected a level of performance that inspired confidence and that was greatly improved.

While conducting these distance measurement tests, the flow results at various test "depths" were monitored and compared to known flow values for 18" Parshall Flume flowmeters. The measurements showed some discrepancies at low levels, but were increasingly accurate as "flows" rose. At higher flows the results were spot on. (It should be noted that the measurements cannot be expected to be 100% accurate in our test jig. The temperature transducer was located in the vault where ambient temperature was much warmer than at our test jig. Thus, the sound speed compensation was off somewhat. Our test target is also wood, as opposed to the flume's water, resulting in different resonant characteristics. So some difference at low flow was not unexpected or alarming in our tests. The jig provides an easy way to test target settings and instrument set-up and is more accurate than trying to provide a movable target in the flume itself. All of our test results were within expected tolerances.)

After adjusting the two parameters mentioned above, we were able to measure flow down to 11 gpm with consistency. Due to the flow measurement cutting-off at 4", previous minimum flow measurements would have been around 400-350gpm. Any flow below that would have been ignored and un-measured.

Mill Creek Flow Meter Calibration

Also on September 26, 2014, MCC CS tested the flowmeter located at the Mill Creek intersection. This flowmeter is also an exponential flume type with an ultrasonic transducer. It however uses a Sigma 970 flow measurement instrument.

Calibration and maintenance are very simple for this instrument. Other than regular cleaning, the manufacturer does not recommend any other servicing. "Calibration" merely consists of measuring the actual head and flow media depth and then comparing that information to the 970's actively displayed data. This activity is what was performed and the measurements were found to be spot on. MCC CS is confidant this instrument is performing properly.

It should be pointed out that this device is long discontinued and no longer supported by the manufacturer. It may be worth beginning to consider a replacement for the Mill Creek Sigma 970. While the device itself is currently fine, as it is no longer supported and is a "vintage" piece of equipment one must expect it to expire in the not too distant future. It would be prudent to plan accordingly.

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MEMO 1

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Flowmeter Accuracy, Installation and Related Issues

Some time ago, the topic of flow differential between the WWTP's recorded influent and effluent totals was discussed. Quoted below is the email reply to this topic.

As you are well aware there are numerous variables involved in evaluating why recorded flow between two such instruments can differ. They include:

- *Whether influent liquid is being re-routed (temporarily) through the process to assist with aeration, digestion, etc.*
- *Whether liquid is being re-directed for use in sludge thickening (depending on the sludge processing this can account for an almost 1% difference in flow totals alone, according to my research).*
- *Whether water is being used for on-site irrigation.*
- *Losses to evaporation can be significant as well, depending on time of year and the processes involved.*
- *Influent solids are likely less of a concern than we expected. From what I've learned a heavy solids concentration is around 1250 ppm (roughly .1%).*
- *And most importantly, no two instruments ever are in perfect agreement. We can honestly expect a .5% difference between the two flowmeters to be normal.*

With all of that reiterated, after speaking to others here at MCC with far more experience than myself, we all agreed 2% was not an unreasonable difference over a roughly two year period between the influent and effluent meters. As your most recent calculations show a difference of only 1.45% I feel comfortable that your differences in flow are well within an acceptable margin.

While onsite on the 26th of September, more information was provided which relates directly to this topic. As detailed in the attached drawings, there is a significant installation issue with the installation of the WWTP's influent flowmeter. An elevation discrepancy exists between the flow meter flume's outlet and the piping behind it. This conceivably could cause flow to back-up into the Parshall Flume. This would greatly, and adversely, affect the accuracy of the device. The elevation difference appears to be .27 tenths of a foot. This equates to roughly 360 gpm if my calculations are correct. Combined with the mis-set parameters found in the flowmeter, it seems likely there has been a great deal of flow through this device which has gone unrecorded over the years. Unlike the parameter issue, the issue with the actual installation will be much more difficult to address. While there are tests which can be performed to determine if the flume is suffering from a submergence condition, they would require an amount of labor equal to installing a new flow measurement device. As such, it would be the opinion of MCC CS that the effort would be better directed at procuring and installing a replacement flow measurement instrument that would not be affected by the flume's actual physical installation. MCC CS concurs with the City opinion that a Hach FloDar would work well as the WWTP influent measuring device. Eventually, the best course of action would be to replace entire Parshall Flume with a Magnetic Flowmeter (such as a Siemens Sitrans). These are the world wide industry standard and almost above reproach for accuracy and dependability. Given their factory calibration and the need for zero maintenance after installation, installation of such an instrument would provide a great deal of peace of mind for the City in this application.

While this paragraph may seem to conflict with some of what is written above, it is worth pointing out that despite all of the issues mentioned in this portion of this report, a differential of 1.45% as discussed

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above is still within an acceptable margin. Whether the data gathered to arrive at this 1.45% flow differential was accurate may be questionable given the physical installation issues that have come to light as well as the OCM III's previous configuration. It also brings into question the 1.45% itself. Until an influent flowmeter is in place that is known to be reliable and accurate, flow totals, flow differentials, and the like are somewhat conjectural.

The current influent flow meter is configured as accurately as possible. The OCM III is functional and providing accurate flow totals in relation to the flume depths it is detecting. Any issues that may exist with the flume installation are outside of what can be corrected by the OCM III set-up.

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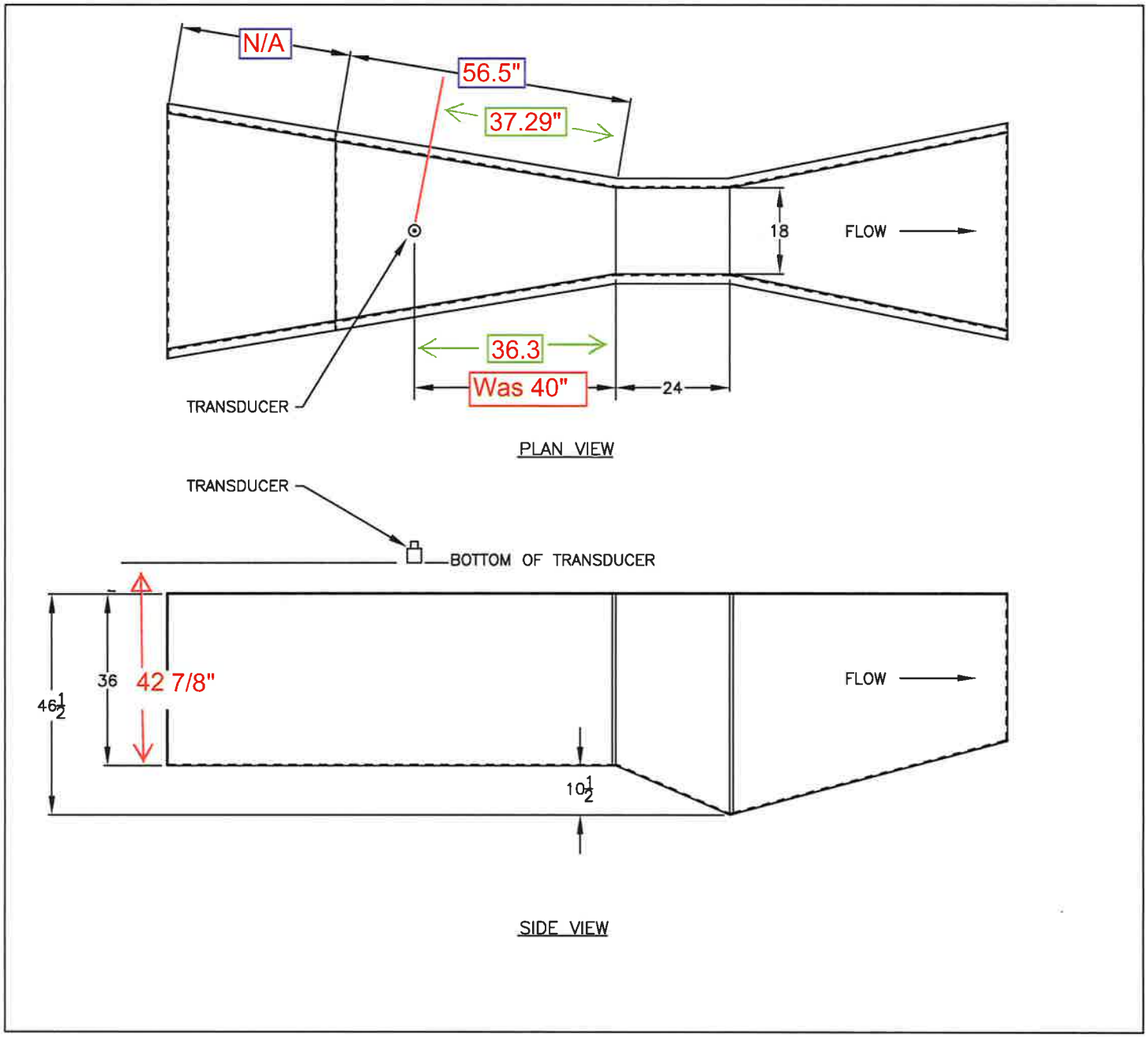
MEMO 1



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DIMENSIONS

UNLESS OTHERWISE SPECIFIED
INCHES
AND TOLERANCES FOR
1 PLACE DIMS ± 0.1
2 PLACE DIMS ± 0.01
3 PLACE DIMS ± 0.002
ANGULAR DIMS ± 30'
FRACTION DIMS ± 1/32"

0" 1"

THIS LINE EQUALS ONE INCH, IF NOT ON THIS SHEET, ADJUST SCALES ACCORDINGLY

REVISIONS

NO.	DATE	REVISION	BY	APP

TESTING

TEST	DATE	BY

PROJECT: WILLITS WWTP

TITLE: 18" FLUME

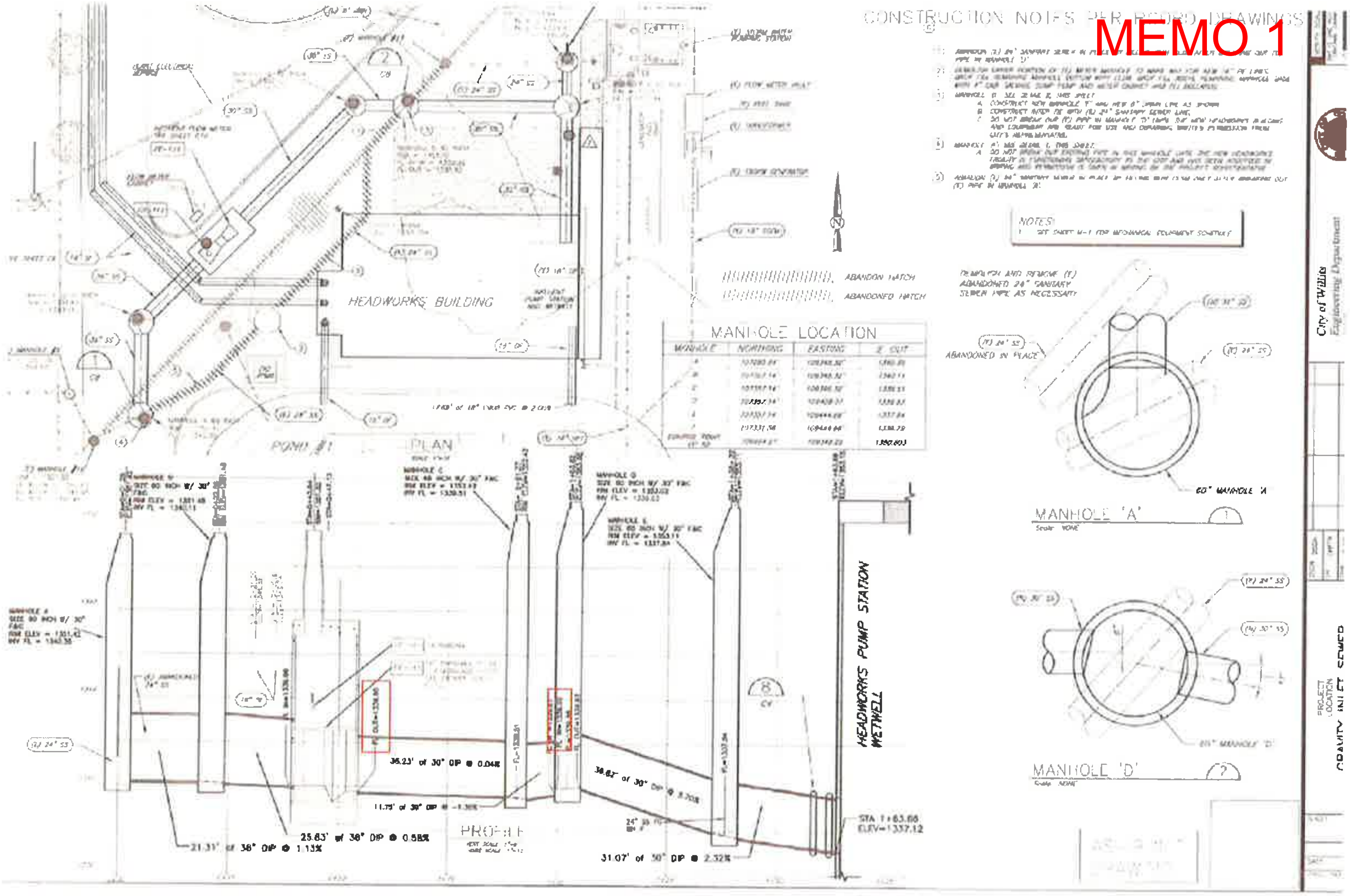
CUSTOMER:

DESIGNED BY	RB	DATE:	10/13
DRAWN BY	PC	SCALE:	NTS
CHECKED BY	RB	REF:	
APPROVED BY	RB	SHEET	1 OF 1

SIZE: A

DRAWING: 07640.01-A01

MEMO 1



CONSTRUCTION NOTES PER RECORD DRAWINGS
HEADWORKS BUILDING
ABANDON HATCH
ABANDONED HATCH
NOTES:
MANHOLE LOCATION
PLAN
PROFILE
MANHOLE 'A'
MANHOLE 'D'
HEADWORKS PUMP STATION WETWELL
35.23' of 30" DIP @ 0.04%
25.63' of 36" DIP @ 0.58%
21.31' of 36" DIP @ 1.13%
31.07' of 30" DIP @ 2.32%
STA 1+63.68
ELEV=1337.12
City of Willits
Engineering Department

MEMO 2

MCC CONTROL SYSTEMS
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October 3, 2013

MCC CS inspected the Influent Siemens Open Channel Flow Meter at the Willits WWTP on October 1, 2013. We had been asked to examine the flow meter to determine if it was operating properly. Brelje & Race Consulting Engineers was onsite concurrent with our presence.

Several things must be explained as a preface to our report.

- Flowmeters cannot be field **calibrated** except under extraordinary circumstances. Depending on the type of meter, doing so without the manufacturer's engineering representative present usually voids the warranty as well as any guarantee of accuracy.
- Open flume flowmeters can have their calibration adjusted more easily than Ultra-sonic or Magmeter type meters.
- This calibration is dependent upon accurately measuring the **actual flow**. This can only be done by routing the flow into a sealed vessel where in the actual volume of liquid can be then measured and correlated against the time it took to fill the vessel.
- This must be done with the utmost accuracy. The calibration is only as accurate as the least significant digit in any of the measurements.
- Calibration must be done at as many different flow medium levels in the flume as is possible and each measurement must be repeated as many times as possible to achieve an accurate mean number at each level. In our case, I would feel it necessary to measure flow at 1 inch intervals from 0 to 36.
- This obviously borders the impossible due to time constraints and the reality of flowmeter piping installations.
- All flowmeters are more accurate the higher the flow volume. Almost all are inherently inaccurate at low flows. Some more so than others depending on the volume of media to be measured, where it is to be measured, and the type of meter in question. Meter selection is a balancing act of media, physical installation requirements, maintenance concerns and environmental concerns.
- As might be expected from the above information, MCC CS can only vouch for the configuration (that is the set-up) of the current Influent flowmeter. We can offer a "ball park" assessment of accuracy.
- Contrary to what some parties involved in this issue seems to believe, when Robert Pitts of MCC CS was involved with this meter some months ago, he did not calibrate it. Nor did he configure it. He checked it for fault codes and any obvious errors in parameter set-up. As he found nothing of significance, he left it configured as he found it.
- The presence of Brelje & Race was unexpected by MCC CS. Many of the tests they ran were ones we had intended to.

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With all of the above stated, we can discuss our findings.

The Siemens flowmeter is a Milltronics OCM III. At first inspection it seemed to be installed and functioning correctly. We made several measurements of the actual physical installation of the hardware as accurately as was possible under the conditions present. Doing so was important in that the physical dimensions are crucial to proper set-up and function of the flowmeter. It is also desirable to have such information recorded for future use.

During the testing and evaluation several areas of concern became apparent.

- The most concerning of these was that any depth of water through the flume less than 4" did not register any flow. This is greatly concerning as the volume, while not great on a momentary basis, would be large cumulatively. It would be necessary to examine historical trending data from SCADA to see how often flow is "zero". One would expect this should be almost never. Prolonged periods of "zero flow" may indicate unrecorded influent flow.
- The ultra-sonic transducer appears to be mounted too low. The manufacturer's manual specifies the face be greater than the "blanking distance" from the top of the flume (max head height). This is not the case as our drawing of measured dimensions shows. Blanking distance is set at 12 inches, which is likely near the minimum blanking distance for such a transducer and cannot be reduced. And while maximum head is set in the parameters at 30 inches, the top of the flume is 36 inches. Under normal conditions, this allows a margin of .5 inches. As the influent could get to 36 inches, the current installation is possibly inadequate under some conditions of high flow. It would be advisable to raise the transducer six inches or so if possible. (Blanking distance is the area close to the transducer in which it cannot accurately measure distances and the flowmeter is thus configured to ignore such false readings in that area.)
- We also noted a good deal of solids deposits on the downstream slope of the flume. This can act as an unintended weir and throw off the accuracy of the Flowmeter. MCC CS recommends these be cleaned out on a regular basis to ensure proper accuracy of readings.

Brelje & Race attempted to record level measurements and flow readings and we applaud their efforts. However, having attempted the same exercise on numerous occasions in the past we were able to recognize areas of concern regarding the accuracy of their gathered data.

- While attempting to determine the accuracy of the transducers' level measurements, they were relying on a hand held scale and clipboard as a reflective target. As these flowmeters measure distance from the transducer to the media surface to determine depth and then use an algorithm to extrapolate flow from depth in a known volume over time (which is a greatly simplified explanation of the process) the distance measurement must be **very accurate**. From experience we know hand held measuring devices are not accurate to .1 inch, much less to the .001 required.

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- Also, while later simulating flow readings, influent level measurements were taken from the installed scale in the flume. This did not provide nearly the fine measurement of level readings needed. Comparing this to the indicated flow shown on the flowmeter Human Machine Interface is made difficult by the damping and sample time intervals built into the flow meter itself.
- In these instances MCC CS has found it best to pull the transducer from service, install it in a test stand with a mechanically adjustable target that can be torqued into position to assure it does not move, flex, or vibrate, and then measure the transducer to target distance with an engineering scale certified to .001 inch at various distances. Any other measurement is simply not accurate enough to calibrate the transducers readings.

We have attached a list of current configuration parameters. We have also attached a drawing of the flume and its dimensions. The flume layout and shape was copied directly from the Siemens manual for the flowmeter in question.

In conclusion MCC CS offers the following observations and recommendations.

- It is clear the current Flowmeter is accurate at mid-range flow levels.
- It is clear it is inaccurate at very low flow levels.
- There exists the possibility for inaccuracy at very high flow levels.
- The current installation requires adjustment of transducer elevation.
- The downstream portion of the flume requires regular cleaning.
- If low flow measurement is a concern, a flowmeter of lesser range is required to accurately record it. The current unit is most likely over-sized for this application.
- Customers having concerns about their flow into the Willits WWTP should install a reputable and accurate flowmeter to measure their discharge. This is the only way to accurately gauge the level of their flow. Doing so is an industry standard between municipalities in similar situations.
- McCrometer and Siemens offer Flowmeters that are considered industry standards.

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MEMO 2

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MEMO 2

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Siemens Milltronics OCM III

Parameters
(recorded 10/1/2013)

P0	Language	**0** (English)
P1	Dimensional Units	**1** (Inches)
P2	Temperature Units	**1** (Fahrenheit
P3	Primary Element	**0** (Exponential Device)
P4	Method of calculation	**1** (Ratiometric)
P5	Flow Rate Units	**3** (US Gallons/Minute)
P6	Flow at Max Head	11023
P7	Height of Maximum Head	30"
P8		
P13	Display Dampening	**0** (Off)
P14	Display Lighting	**0** (On)
P15		**35** (Flow Pulse Totalization)
P16		1000 Gallons/Pulse
P24	mA Assignment	**0** (Flow Rate)
P26	mA Span	**0** (4-20)
P27	mA Damping	10 Seconds
P28	mA Options	**0** (Don't Track Emulator)
P29	Fail Safe Time	60 Seconds
P30	Fail safe analog Value	**0** (Hold Last Value)
P32	Totalizer Multiplier	**3** (x1)
P33	Flow Rate Display	**0** (No Decimal Places)
P36	Measurement Interval	**0** (1 Seconds)
P42	Head Determination	**0** (OCM-3 Sensor)
P45	Low Flow Cut-Off	1.5"
P47	Blanking Distance	12"

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MEMO 2

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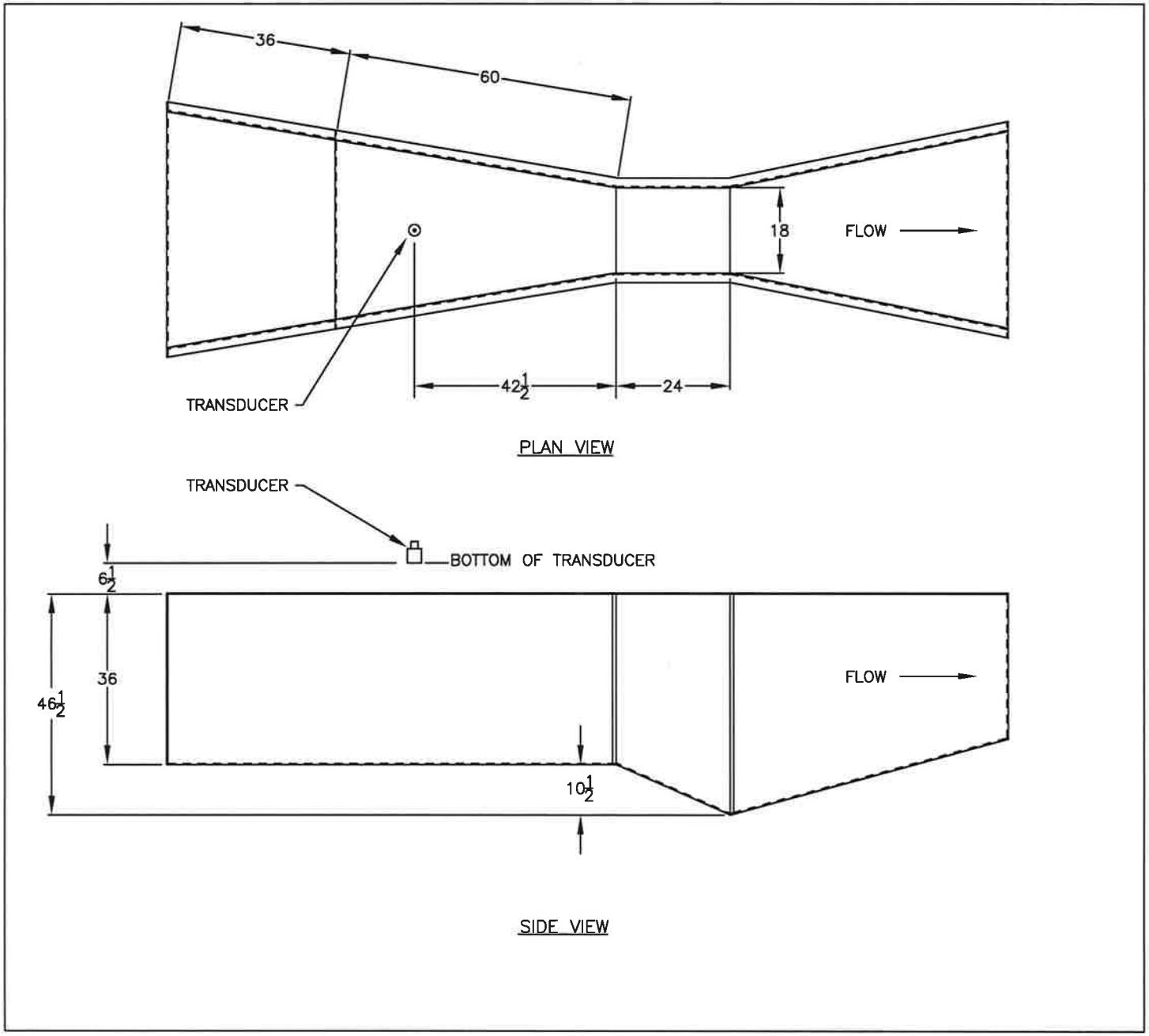
MEMO 2



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DIMENSIONS

UNLESS OTHERWISE SPECIFIED
INCHES
AND TOLERANCES FOR

1 PLACE DIMS	± 0.1
2 PLACE DIMS	± 0.01
3 PLACE DIMS	± 0.002
ANGULAR DIMS	± 30'
FRACTION DIMS	± 1/32"

0" —— 1"

THIS LINE EQUALS ONE INCH, IF NOT ON THIS SHEET, ADJUST SCALES ACCORDINGLY

REVISIONS

NO.	DATE	REVISION	BY	APP

TESTING

TEST	DATE	BY

PROJECT: WILLITS WWTP

TITLE: 18" FLUME

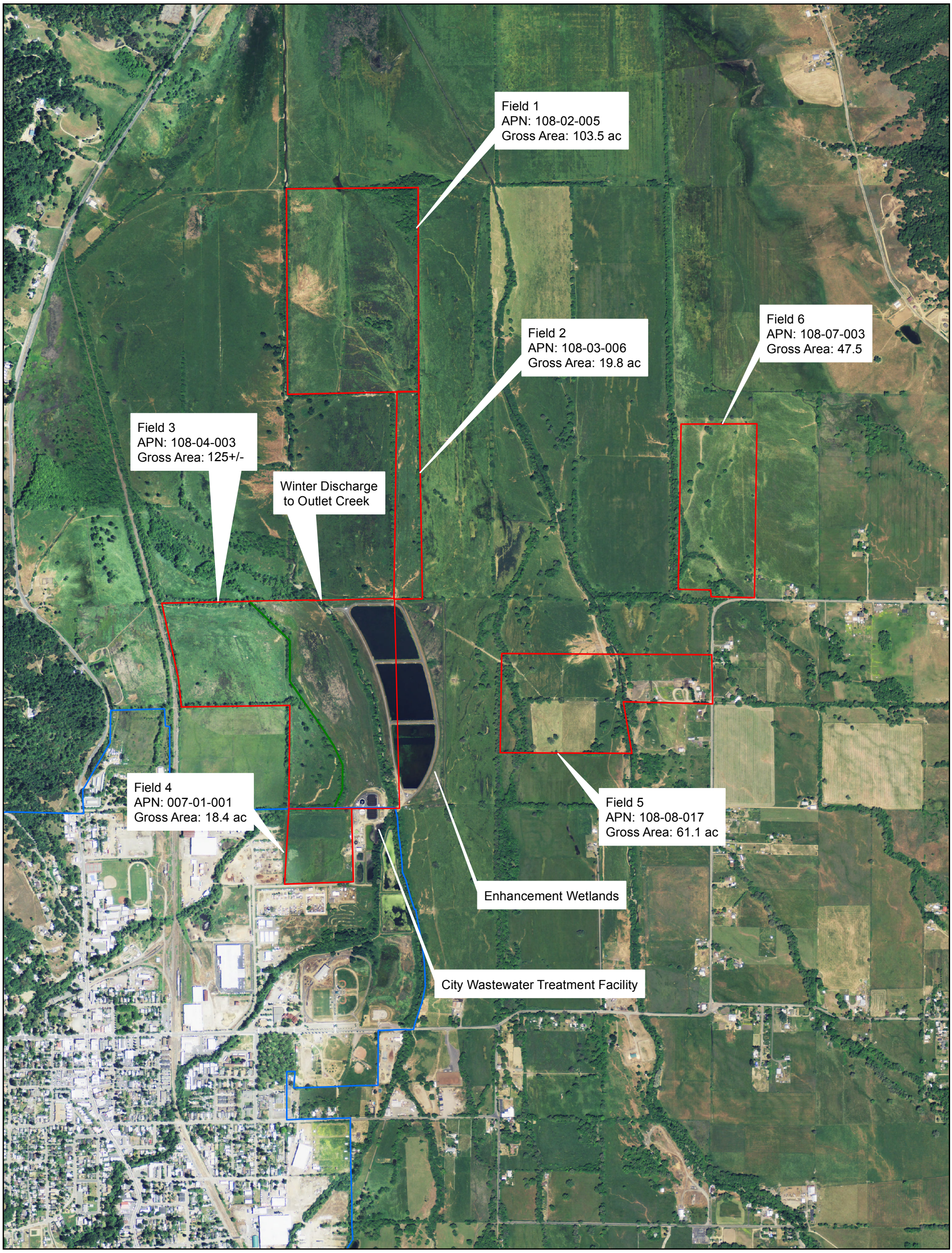
CUSTOMER:

DESIGNED BY	RB	DATE:	10/13
DRAWN BY	PC	SCALE:	NTS
CHECKED BY	RB	REF:	
APPROVED BY	RB	SHEET	1 OF 1

SIZE: A

DRAWING: 07640.01-A01

REVISED C-4 MAP



LEGEND

City Limits

Recycled Wastewater Irrigation Fields

Paper Size 11" x 17" (ANSI B)

0 250 500 1,000 1,500 2,000

Feet

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 10N

N

GHD

City of Willits
Reclamation Study

Map of Reclamation Fields

Job Number 01064-8410772
Revision A
Date 07 Mar 2014

Figure 4

N:\US\Santa Rosa\Projects\01064 - Willits\01064-8410772 WWTP Permit Compliance\08-GIS\Maps\Figures\Figure1_IrrPlan.mxd

718 Third Street Eureka CA 95501 USA **T** 707 443 8326 **F** 707 444 8330 **E** eureka@ghd.com **W** www.ghd.com

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:djcarter