Written comments and suggestions in response to TAC Agenda Item3., Water Resource Managers Report, May 2, 2019

Prepared by Don Decker, domestic well owner representative, written May 8, 2019.

Agenda item 3.a.i) Data Gap Status Report

Slide 1 Sampling and aquifer testing **The Stetson discussion on the topic of periodic IWV well water chemistry analysis is a critical element in Basin sustainability monitoring**. In the past, this topic has been effectively ignored largely because of inherent costs and lack of suitable equipment to sample unequipped monitoring wells. The initial scope as described is an excellent start and further identification of suitable wells must be a priority**. The multiple piezometer BoR wells are going to play a major role in Basin water level monitoring and should be included in water chemistry monitoring also.**

It will be important to identify and put a contract in place for well sampling service using a compact pump/motor (e.g., 2" diameter Redi Flo2) or a small low flow bladder pump. This would be essential to obtain proper samples again from BoR and many other monitoring wells. Unfortunately, the opportunity to obtain canyon stream and cyclic spring water samples is fast disappearing as the weather transitions into the dry summer. The relatively wet winter of 2018/2019 is ending and is not likely to be repeated near term based on the dry year trends evident in the present day precipitation record.

If there is to be a serious effort to further explore the Basin recharge, additional shallow wells should be drilled into the alluvium of the Sierra canyons and fans, potentially using Seabee services. These wells would provide for water chemistry sampling of alluvial water and provide essential lithographic calibration for a parallel shallow seismic study of the Sierra canyons. Funds for this effort could be redirected from proposed Prop 1 stream gage efforts as described in the next section.

Slide 2 Stream gages/weather stations **Placing a weather station at the Chimney Peak Fire Station would no doubt be a very useful addition. An important likely task for the future is to augment the BLM maintenance of the existing RAWS weather stations. Especially important is the Blue Max site at high elevation in Indian Wells Canyon .**

As to stream gages, the two canyons that have significant year round flow, Sand and Grapevine, are already monitored. My previous suggestion of upgrading the recording systems at these sites to a modern digital form is incorporated in the Stetson planning.

One aspect that is not apparently being considered is the unfortunate presence of widespread vandalism and the obvious impact on instrumentation siting. The gage site at Grapevine is more or less secure as a consequence of nearby resident protection. The site in Sand Canyon in its present form is nearly invisible from the entrance road into the canyon and has been subject to minimal vandalism partly as a consequence. Any attempt to add solar panels or antennas as an upgrade to this setup will without doubt increase its visibility. Fencing will not provide protection but rather attention**. For Sand Canyon, I recommend leaving the existing protective box and support pipe as is and replace the mechanical recorder with a digital system powered by a battery that will be replaced perhaps once a**

year. A similar modification for the Grapevine Canyon gage would be appropriate as well. Virtually nothing is gained by the expense of satellite link data transfer.

Placing a new stream gage at a site in Indian Wells Canyon as has been proposed will not provide useful data. The surface flow in Indian Wells Canyon is much smaller than either Sand or Grapevine as this author has repeatedly pointed out. The 2018/2019 water year has been unusually wet. Indian Wells Canyon stream flow has been enough to actually obtain flow estimates using observations at available "natural weirs". **The peak flow in mid Indian Wells Canyon just after the major storm on March 5/6 2019 has been estimated to be 1/150 of the flow in Sand Canyon at about the same elevation and on the same afternoon (See Sierra Canyon Stream Flow Reports authored by Don Decker. There are now 2 of these reports in Stetson files with additional reports to come with future observations and measurements.)**

The stream flows in all of the canyons have a strong relationship with canyon spring water. The stream flows in Indian Wells Canyon are intermittent physically with dry and wet stretches alternating. This canyon bottom spring phenomenon makes it impossible to locate a gage site that could represent the "stream flow". What flow are we going to monitor?

Vandalism is a major issue especially in Indian Wells Canyon. This Canyon is the most obviously accessible to highway 395 traffic and the presence of the brewery and the road connecting the same with the main Canyon road creates further issues. If the gage site were to be at an elevation above 4500 ft it would be in wilderness and at a safer location but also would be in an area with intermittent stream flows.

A new stream gage in an alternate canyon, Nine Mile, is a possibility. Nine Mile has the third largest stream flow of the Sierra Canyons that empty into the IWV. While the peak flows after the March 5/6 storm were impressive, the flow now is small. This canyon also displays intermittent spring related flows in the canyon bottom. There is a location just above the crossing of the 1910 DWP aqueduct that is somewhat protected from vandalism and accessible enough that a gage system could be installed. Just above the aqueduct is wilderness. However, the site just identified is dry much of the year, even in wet years.

I strongly recommend that at a suitable point the Prop 1 proposal be modified and the new Sierra Canyon stream gage project be dropped and the stream gage digital upgrade at Sand and Grapevine Canyons be simplified to battery power as described above. The funds freed up could very productively be used in another data gap project such as the shallow seismic survey suggested above. Part of this money could also be used to productively augment the groundwater chemistry tasks.

<u>Slide 3 DWR Technical Support Services</u> The TSS project that has been approved by DWR to drill and equip another Bureau of Reclamation style multiple piezometer well in the El Paso Basin has proven to be more complex (costly) than expected. **I submit that a major task driving up the cost is engineering and technical support that was offered as in kind or at no cost for the BoR project. It is not obvious that this activity and expense was underwritten to the extent that it was. Under present circumstances it cannot be recreated**. A multiple piezometer installation with accurately placed seals

and gravel packing is a far more complex task than a simple casing- especially in a deep well. It is likely that the El Paso Basin well drilling will encounter hard continental sediments (Ricardo formation?) as was the case for BoR 1. A drilling contractor is going to bid high to cover the unknowns. **We should be prepared to settle on a thoroughly characterized 2,000' well with a single tube completion (6").**

Drilling water will be obtained from the Inyokern CSD at a hydrant just north of 178 on Brown Rd as it has for the majority of wells drilled in the western part of the Valley.

It will be important to coordinate and encourage *complementary* Seabee well drilling activity. We know this is the Stetson intention and this comment is an encouragement to go forward with the same.

Agenda item 3.a.ii) Isotopic Sampling and Analysis

This task is obviously an essential element of the sustainability plan. Substantial prior research and data is already in place as noted. Contracting this task with DRI is entirely appropriate and efficient. Both Stetson and DRI have come a long way in understanding the complexities of the IWV groundwater Basin and the supporting research and reports. This task will undoubtedly be conducted with a working collaboration between Stetson, DRI and the TAC to insure the optimum use of resources. It is important to begin this effort soon, as a substantial design time will be required. A starting point based on a thorough review of the existing data and analysis is correctly identified. **I submit that the weakest areas of the groundwater flow model relate to recharge and discharge aspects. Full advantage should be taken of the ability to access deeper groundwater in the BoR wells using small diameter pumps as was suggested in 3.a.i) above.** These wells were specifically placed to explore the Sierra mountain front recharge. For reference, an additional 2,000' multipiezometer well was planned for the Basin discharge area near the China Lake playa but was never completed.

It will be valuable to review the 2008 AB303 study especially the isotopic age and chemistry portions. The recommendations offered there for further work should be especially useful.

3.b. Sustainable management Criteria: GSP Monitoring network

Slide 5 Minimum thresholds: groundwater levels as a proxy **Obviously groundwater levels are appropriate indicators of groundwater in storage except for areas that are tectonically or hydraulically unstable. However, unless a well defined relationship can be established in specific Basin areas, groundwater levels are obviously not a suitable indicator for water quality or quality changes. It is important to make this distinction so that the need for a properly defined monitoring protocol for water quality is established.**

Slide 6 Monitoring network **Identifying the GSP well monitoring network with CASGEM wells is appropriate since most of these wells are the fully characterized BoR wells. However, the CASGEM set is incomplete in some Basin areas as has been suggested previously by this author. For example, section 17 that has been identified by Stetson as an area of especially high water level declines is not properly monitored by the existing CASGEM set. Fortunately, there is an appropriate well available,**

North American Chemical Corporation T26S R39E 17-1. This well was drilled and characterized very carefully and is in the KCWA well monitoring data base. The other Basin area that is not properly represented in the proposed set is the Basin discharge zone near the CL playa. There are many wells in the greater vicinity of the Navy airfield and playa that should be considered with Navy inputs as guidance.

3.c. Projects and management actions: land subsidence analysis

Slide 2 Topic outline **The DRI presentation is a comprehensive summary of existing InSAR and land survey results. A methodology for separating subsidence caused by tectonic effects from groundwater extraction is outlined. This preliminary outline should be further developed to the extent possible.**

Unfortunately the IWV "historical subsidence" described in this study does not include or even recognize the localized subsidence evidence from groundwater pumping in the 1920 to 1950 timeframe. This is not a criticism as no known quantitative evidence exists from this early era except for the existing present landforms. Two IWV areas have experienced notable groundwater extraction subsidence: 1) an area of early farming of several sq. miles centered more or less at Brown and Neal Ranch Rds., 2) an area of about 1+ sq mile centered at the old Bowman Ranch. The present day Walmart is on this site. Both locations were recognized by early farmers and well drillers and evidence once included older well casing protrusion at both locations. Both of these locations are known to have significant underlying clay zones.

Both subsidence areas have experienced substantial ongoing surface disturbance in modern times and InSAR exploration is not possible. However, an important effort should be undertaken to install and maintain a set of CGS benchmarks not only at these sites but at specific infrastructure sites that may be subject to subsidence. These benchmarks can be regularly monitored by GPS. On the short list would be the two Caltrans overpasses, the Inyokern Airport and the Ridgecreast Hospital. Additional locations on Navy property may be important also.

3.e. Projects and management actions: modeling scenarios

Slides 3 and 4 **These slides provide a summary of the broad scope of the considerations being taken by the GA staff and consultants in attempting to devise a fair and equitable GSP. As we are all aware,** the **IWV groundwater supply shortfall is so severe that there is little possibility of a functional GSP that would be regarded favorably by all parties.**

The recent exclusion of the TAC and PAC committees from the ongoing discussions is unfortunate as these committees are the principal public interface to the GSP process. Further damaging the public involvement are the persistent GA Board closed session actions. It is very clear that sustainability will require a pumping reduction so severe that all low priority pumping (usually identified with agricultural and industrial use) will have to cease along with great reductions for all other pumpers. **Fairness would say that stopping all low priority pumping requires an associated effort to provide compensation for the accompanying losses. Contracting for professional property assessors is a proper and timely step**

to take here. In addition, serious effort needs to be placed on identifying and securing buyout funds which for IWV agriculture alone will amount to ≈$70M.

Slide 5 **The IWV Domestic Well Owners Association has submitted a "Sustainability Plan Outline" dated January 9, 2019 and a set of "Plan Notes" dated January 2019. The first element in this Plan is to provide a "basic allocation" to all water connections presently being served in the IWV and Searles Valley and fully recognize a Federal Reserved Water Right quantity for the Navy. This is very similar to the "minimum water use allocation" in slide 5. Defining this allocation as a "basic allocation" as we have done, avoids the inevitable arguments about what constitutes "basic health and safety".**

Slides 6,7 and 8 The scenarios described in these slides are based on possible ways to reduce Basin pumping to sustainable levels. **None of these scenarios will be acceptable to the major agricultural or industrial pumpers involved particularly since they are based on forced allocation actions taken by the GSA Board. It is perhaps worthwhile to point out again, the second element of the Domestic Well Owners Plan proposes a market force approach to reach sustainability. No forced allocations are involved. Instead, a market price for imported water delivered into the IWV Basin is identified upon which a pumping surcharge will be based. This surcharge will accomplish two things: 1) money collected will be directed specifically to the infrastructure costs for imported water and 2) lower market value water pumping will be minimized. This surcharge will be allowed to ramp up over a period of time, perhaps a decade, to allow the affected parties to adjust more gradually to the new reality of higher cost water. At the end of the ramp up all pumped water except for the basic allocation will be priced at imported water cost. With proper design, by the time the ramp up ends the Basin will be close if not at a sustainable condition. Hopefully, imported water can be obtained to supplement the basic allotment supplied by natural recharge.**

We have heard criticisms that the market force surcharge we are proposing is not legal. If no water surcharge for imported water is possible how would we ever pay for the same? The ramp up is not an arbitrary feature, it is offered as a benefit to those pumpers who will need time to adapt to the higher price of imported water. From the Plan Notes identified above a sixth pumping scenario can be easily developed.

<u>Observations and calculations of surface stream flow volume and electrical conductivity in Indian Wells, Short, Sand and Nine Mile Canyons in the southern Sierra Nevada Mountains, California, as observed on 4/15/19 and 5/3/19 by Don Decker</u> – Report #3, 5/9/19 r2

A. Introduction

This report contains new data and information from Canyon visits on 4/15 and 5/3. The weather in the Indian Wells Valley in the days after the 4/15 visit was significantly warmer with many days in the upper 90's. No significant precipitation occurred from any of the fronts that did pass through during this period.

As suggested in Report #2, electrical conductivity (EC) of canyon stream water has now been obtained using a calibrated, temperature compensated, portable instrument that is described in section E. below. Stream water samples were collected in a clean plastic cup from the fastest flowing zone at a given site. After some stirring to mix the sample thoroughly, EC measurements were taken with a 1½" immersion of the instrument. A settling time of about 45 seconds was typically required to obtain a stable consistent result.

Weir measurements are given in this Report for the USGS weir in Sand Canyon as was documented earlier in Reports #1 and #2. Flow rates in this and other canyons where "natural weirs" can be found are also reported and analyzed using the standard rectangular notch weir expression with the assumption that such a calculation will be a useful *approximate* flow rate as was incorporated in the earlier Reports.

Latitude and longitude coordinates and elevation for specific measurement locations have also been determined using a Garmin GPS unit. This position and especially elevation data should be double checked as satellite signal strength was low at some canyon locations.

Results and observations from the two earlier canyon visits (3/8 and 4/5) as well as the recent canyon visits (4/15 and 5/3) are summarized in an attached chart.

B. **<u>Canyon measurements and notes</u>**

<u>Indian Wells Canyon</u>:

The surface flow in Indian Wells Canyon at the "natural weir" located about 5/8 mile above the 1910 DWP aqueduct is now *dry* as is recorded in the 5/3 field notes. The elevation here is about 3600 ft. There is damp silt in the stream bottom at this location indicating that flow did exist not long ago. The Canyon stream has retreated up canyon about ¼ mile. The EC at a location not far above the end of the flow is now (5/3) 905 compared to 870 (µS/cm) at the same location three weeks earlier (4/15) (see attached chart). A similar or even larger increase in EC is seen in most of the other canyon data for these dates as is expected from the earlier evidence for significant evaporation loss in the canyon surface water flows and the substantially higher temperatures during this period. **This trend can be expected to continue as even higher summer temperatures approach.**

Measured EC varies by as much as $\pm$ 10% across the width of a given stream flow from imperfect mixing of the non uniform evaporation or spring water entry. This phenomenon is especially noticeable in the shallow flow of Indian Wells Canyon. **A reproducible measurement can usually be obtained from a sample from the fastest flowing zone.**

<u>Short Canyon</u>:

The stream flow in this canyon (5/3) has retreated up into the bed rock exposure of the lower canyon. The retreat is about 100 ft. from 4/15. The elevation here is about 3500 ft. **The flow is small but appears to be somewhat larger than the slight flow in lower Indian Wells Canyon as was previously commented in Report #2**.

Sand Canyon:
The stream flow in Sand Canyon was nearly constant for the two weeks before 4/15 after a very large initial decline (see Report #1 (3/8) and #2 (4/5)). The flow is now substantially lower yet (5/3) and is filling the small 2 ft wide USGS weir to about half height. The staff scale reads about 0.48 ft. Using the rectangular weir expression as previously:

$$Q \approx 3.33 \bullet 0.33 \bullet 2 = 2.2\ ft^3/sec$$

This flow is now only 4% of the flow just after the early March storm.

There is a small spring just east of the 1910 DWP aqueduct on the north side of the road that has not noticeably changed flow rate over this entire observation period. This spring feeds into the pond that is under and to the east of the aqueduct pipe itself. The EC of water from this spring just as it is discharged at the surface is 1715 and the pond water itself is 1526 µS/cm. This water joins the main canyon flow downstream and may be the origin of the relatively large increase in EC between water just west of the 1910 aqueduct to that at the weir. **This spring may be contributing more water to the main canyon stream flow than is apparent.**

Surprisingly, the flow out onto the canyon fan has maintained its earlier daily oscillatory extent even now. The maximum length on the fan is little different from 2 months ago. **The EC at the two locations sampled on the fan are *lower* than at the canyon mouth. (See the attached chart.)**

Note: **The rock partially blocking the small Sand Canyon weir opening, as was noted in Report #2, was removed (mid afternoon 5/3). Accordingly, the staff reading decreased from just below 0.50 ft. to a new stable reading of about 0.48 ft. in a few minutes, as the weir pond drained down to a new equilibrium.**

Nine Mile Canyon:
The stream flow in the lower canyon has decreased steadily since first observed (on 4/5) and is now much smaller than was observed just three weeks ago (4/15). The flow path takes a bend at the canyon mouth on the fan and heads southeast. **Although the flow is significantly smaller visually than observed in Sand Canyon, the surface flow length on the canyon fan is about twice the length observed at Sand Canyon. Like Sand Canyon, it also has remained almost unchanged in maximum length since first observed in this study and continues to oscillate with daily temperatures. Also, like Sand Canyon, the EC measurements of the fan surface water are *lower* than at the canyon mouth.**

C. Summary of important observations and conclusions.

1. In regard to canyon stream water EC, it was initially assumed that: i) the initial relatively low EC precipitation water would dissolve salts from the rock of the upper canyons, especially from the rapidly weathering meta-sedimentary component. This action would continue more or less with the surface and alluvial stream flow down the canyon; ii) Independently, the stream water salt concentration would increase steadily down canyon as a result of evaporative and especially transpiration loss; iii) Upon leaving the canyon mouth, the salt concentration in the surface flow would remain more or less constant out onto the fan. **Assumption i) and ii) are well borne out by the EC measurements. However, it is observed that the EC of the fan surface water is actually lower than at the mouth of the canyons. Such behavior has been verified at Sand and Nine Mile Canyons and is a surprising discovery.**

2. Evidence supporting hypothesis ii) is easy to see in comparing corresponding EC measured values between 4/15 and 5/3 in the attached chart for the stream flows in all three major canyons. Further evidence of significant canyon water evaporation/transpiration and retention comes from the observation that there is an ever increasing salt crust buildup on the stream banks and rocks in all of the mid to lower canyons and fan flows examined, as the air temperatures have increased approaching

summer conditions. The crusts are obviously forming from evaporation from stream and alluvial water that has a significant salt content. This is consistent with the relatively high TDS observed at mid to lower elevation Sierra Canyon well, spring and surface water as reported in many papers (> 500 ppm). The canyons are simply not being "flushed out" entirely as one might expect on a simple conceptual model.

3. In regard to the lower observed EC values for the fan water, this phenomenon is likely due to the admixture of higher quality alluvial water with the surface water flow on the fan. This explanation itself contains two additional assumptions: a) The alluvial water is of lower EC than the surface water and b) There is sufficient artesian pressure to force the alluvial flow to the surface on the fan at least at some locations. Both of these hypotheses in principle should be easy to verify. The first indication of lower EC flow water in both Sand and Nine Mile canyons is near the canyon mouth and is thus more or less coincident with the Sierra frontal fault zone. It will take a much finer sampling grid to discover the origin (location) of this phenomenon.

4. The fan surface and alluvial water mixing, assumption 3., implies that some fraction of the canyon alluvial water is ultimately also being lost to evaporation on the fans. It has been observed that there are extensive areas of nearly saturated sand in the fan flow vicinity that remain so even when the flow itself diminishes in the daytime heat. **Relatively inefficient fan alluvial recharge is consistent with the observation that there are deep dry wells located on the canyon fans.** The 900' dry well that this author has pointed out previously on the Nine Mile fan is about ½ mile north from the present course of the fan stream.

5. The observation that substantial water is being *evaporated/transpired* from the canyons is also supported by the daily cycle of the fan stream flow extent changes. As the air temperature decreases in the late afternoon or with cloudiness, the fan flow extends further out onto the fan. This effect is substantial for both Sand and Nine Mile Canyons and has persisted even as the Canyon flow volume decreases week by week. **The admixture of additional alluvial water with the surface water may also account for the observation of persistent surface fan flow.**

6. **To summarize this section: There is a substantial fraction of canyon flow water that is lost to evaporation that must be accounted for in a canyon recharge estimate. Some remaining fraction of the precipitation water is passing down canyon and ultimately absorbed into the fan alluvium and presumably actually does reach the Basin aquifer as recharge. The Sierra Canyon recharge water will have a relatively high TDS as a result of its canyon passage.**

D. Suggestions for useful future exploration

1. A set of small bore shallow wells drilled into the canyon alluvium starting on the fan and proceeding to high elevation to determine depth to water and thus water flow gradient and an estimate of the flow itself.

2. Water samples could be taken from these wells to determine the water chemistry of the surface and alluvial water which could provide a further understanding of the origin of the water types observed.

3. Especially interesting would be to sample the physically intermittent (spring) stream flows in the canyons. What fraction of this water is coming directly downstream and what fraction has taken a more circuitous route?

4. **Unfortunately, the opportunity to do even the limited measurements as have been undertaken in this effort likely will not be possible to repeat for years. This water year has been an exceptional event.**

E. Preparation for this report

A portable digital electrical conductivity (EC) meter suitable for reliable, accurate field measurement of stream water was identified and purchased. The instrument chosen is offered by HM Digital Instruments and is their Aqua Pro model AP-2. The range covered is 0-9999 µS/cm with a resolution (precision) of 1µS/cm and with a stated accuracy of ±2% of the measurement. In addition to the EC electrodes, the instrument incorporates a temperature probe and the EC values displayed are temperature compensated to 25 °C internally. Calibration and reproducibility have been repeatedly checked against carefully prepared standard NaCl solutions having nominal EC values (25 °C) of 700 and 2,000 µS/cm. Multiple measurement checks of these solutions made before and after field measurements reveal repeatable instrument readings that agree with the nominal solution values within ± 1%. **For reliable calibration or field measurements, it is essential to not contaminate the calibration solutions or electrodes and to rinse the electrodes in distilled water and dry the same afterward. It is also important to clean the electrodes with isopropyl alcohol if plant oils are present in the native stream water (which they always are to some degree).**

The coordinate locations and elevations were determined by use of a Garmin nüvi model 1450 GPS unit. There is inadequate reception from some GPS satellites at some canyon locations where high canyon walls can block line of sight signals.

		Summary of Indian Wells Valley Sierra Canyon Stream Flow Properties 2019 DD 050319 r													
		Note: El in ft, weir data L,H in ft, calculated flow in ft3/sec, EC in microsiemens/cm													
Canyon ID			8-Mar	Rpt #1		5-Apr	Rpt #2		15-Apr	Rpt #3		3-May	Rpt #3		Notes
El	Lat N35	Lng W117	Weir	Calc flow	EC	Weir	Calc flow	EC	Weir	Calc flow	EC	Weir	Calc flow	EC	
Indian Wells Canyon															
4360	42.25	56.778							1.0, 0.1	0.1	570				
4205	42.05	56.508							0.8, 0.1	0.07	620				
4150	41.954	56.439							0.8, 0.09	0.07	640				crossing wash
4100	41.862	56.363							0.7, 0.1	0.07	661				trees in wash/spring
4050	41.764	56.215							0.7, 0.1	0.07	701				crossing wash - no trees
4000	41.657	55.974									772				
3890	41.285	55.567									816				
3650	41.162	55.343									870			906	crossing wash
3598	41.039'	55.061'	1.0, 0.25	0.4		0.3, 0.06	0.02		0.3, 0.06	0.02	937	0		dry	"natural weir"
Short Canyon															
3496	42.642	55.118									576			624	samples taken 100' beyond end of road
Sand Canyon															
3170	46.668	55.378									598				end of road
3085	46.705	55.322									632				concrete apron crossing - in water
2984	46.531	54.919									638	1.7, 0.25	0.71	684	150' w of 1910 aqueduct
														1715	spring near 1910 aqueduct
														1526	pond at 1910 aqueduct
2875	46.575	54.444	staff 2.1	59		staff 0.80	4.8		staff 0.78	4.6	700	staff 0.48	2.2	740	usgs weir
2790	46.536	54.053									710			723	concrete apron at cyn mouth
2757	46.616	53.742									703			716	concrete apron near new aqueduct
2593	47.12	53.168									692			674	end of flow 4/15 at 2000 hrs
Nine Mile Canyon															
3440	50.59	55.599									1060			1118	at 1910 aqueduct
2962	50.151	54.27									1220	0.8, 0.08	0.06	1281	at new aqueduct- mouth of cyn
2649	49.438	53.334							0.9, 0.06	0.04	1140	1.0, 0.08	0.07	1126	at power line
2625	49.332	53.113									1140				end of flow 4/15