City of Tracy
333 Civic Center Plaza
Tracy, CA 95376

CITY MANAGER'S OFFICE

MAIN 209.831.6000
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October 14, 2013

Mr. Robert Sarvey
501 W. Grant Line Road
Tracy, CA 95376

Dear Mr. Sarvey:

Thank you for your October 3rd letter to the City Council regarding the proposed Schulte Road purchase by Surland Companies and related issues. There are several policy issues you referenced that need clarification in my opinion.

Reconsideration of the Schulte Road sale is impractical at this juncture. The City has made commitments to the Federal government to activate the property in the aftermath of Congress' removal of land use restrictions. The General Services Administration has made it clear delays will not be tolerated although the Federal shutdown could be problematic. You may recall the City went through a competitive solicitation for the disposal of the Schulte Road property. The City received two proposals from solar development companies in addition to Surland Companies. I recommended the City sell to Surland because it was superior financially, and ensures compliance with the Federal Government's time restrictions. The sale price is set by current market value based on an appraisal.

Surland Companies was notified of their failure to pay according to their development agreement, but the City Council also extended the period for them to come into compliance. The delay in the $2 million installment will have no impact on the second installment of $8 million. Surland's $10 million commitment would be due in one lump sum in 2015.

The City has maintained close communications with the GSA throughout this process, and they are actively participating in the closing process with Surland Companies.

I hope this information provides sufficient clarification. If you have any additional questions, please let me know.

Sincerely,

R. Leon Churchill, Jr.
City Manager

cc: Tracy City Council

September 3, 2013

AGENDA ITEM 5

REQUEST

APPROVAL OF A PURCHASE AND SALES AGREEMENT WITH SURLAND COMMUNITIES LLC FOR THE DISPOSITION OF THE CITY-OWNED 150- ACRE SCHULTE ROAD SITE (APN 209-230-30) AND AUTHORIZE THE MAYOR TO EXECUTE THE AGREEMENT

EXECUTIVE SUMMARY

City staff and Surland Communities LLC ("Surland") have been negotiating a purchase and sales agreement for the disposition of 150 acres of the city-owned 200 acre Schulte Road Antenna Farm site. This staff report requests that Council approve the Purchase and Sales Agreement with Surland.

BACKGROUND

The Schulte Road property is approximately 200-acres in total and is located on the south side of Schulte Road, west of Lammers Road (see Attachment A).

On May 21, 2013, Council directed staff to begin negotiations with Surland Communities LLC to purchase and/or lease the 200-acre Schulte Road site. This agenda item represents the approval of the Purchase and Sales Agreement with Surland Communities LLC for 150 acres of the 200-acre Schulte Road site.

DISCUSSION

The City and Surland have been negotiating a Purchase and Sales Agreement for 150 acres of the 200-acre Schulte Road site. A copy of the Purchase and Sales Agreement will be distributed prior to the meeting.

Staff will be negotiating a lease and/or purchase agreement with Surland for the remaining 50 acres of the Schulte Road property in the near future.

The 150 acres Surland is purchasing is subject to restrictions that the property be used for educational and/or recreational purposes. However, Congressional legislation authorizes the removal of the use restrictions and reversionary rights on the 150 acres in exchange for the City paying the General Services Administration ("GSA") fair market value for the property. GSA has determined that fair market value for the property is $1.6 million. GSA has given the City until November 1, 2013 to pay this amount.

The Tracy Municipal Code provides that the disposition of real property shall be by competitive proposals unless the City Council, by resolution, determines that other procedures are in the best interest of the City. The City previously issued a Request for Proposals for this property. Because of the time lines established by GSA for payment for the removal of the use restrictions, staff believes that an additional competitive process is not in the City's best interests.

Pursuant to the Purchase and Sale Agreement, Surland will be purchasing the property for $1.6 million, which represents the cost to remove the use restrictions and reversionary rights on the property.

STRATEGIC PLAN

This agenda item supports the City Council approved Organizational Efficiency Strategy;

Goal 1: Advance City Council's Fiscal Policies

1. To change the City's organizational and fiscal structure, and
2. To take advantage of funding and revenue generating opportunities

FISCAL IMPACT

There is no impact to the General Fund as a result of approving this Purchase and Sales Agreement with Surland. If the Purchase and Sales Agreement is approved, the City may save approximately $1,000,000 in Residential Area Specific Plan (RSP) funds previously appropriated in that Surland would now purchase the 150-acre property instead of the City paying the purchase cost.

RECOMMENDATION

Staff recommends that Council approve by resolution, the Purchase and Sales Agreement with Surland for the disposition of 150 acres of the City-owned 200-acre Schulte Road site (APN209-230-30) and authorize the Mayor to execute the agreement.

Prepared by: Andrew Malik, Development Services Director

Reviewed by: Maria A. Hurtado, Assistant City Manager
Jenny Haruyama, Admihistrative Services Director

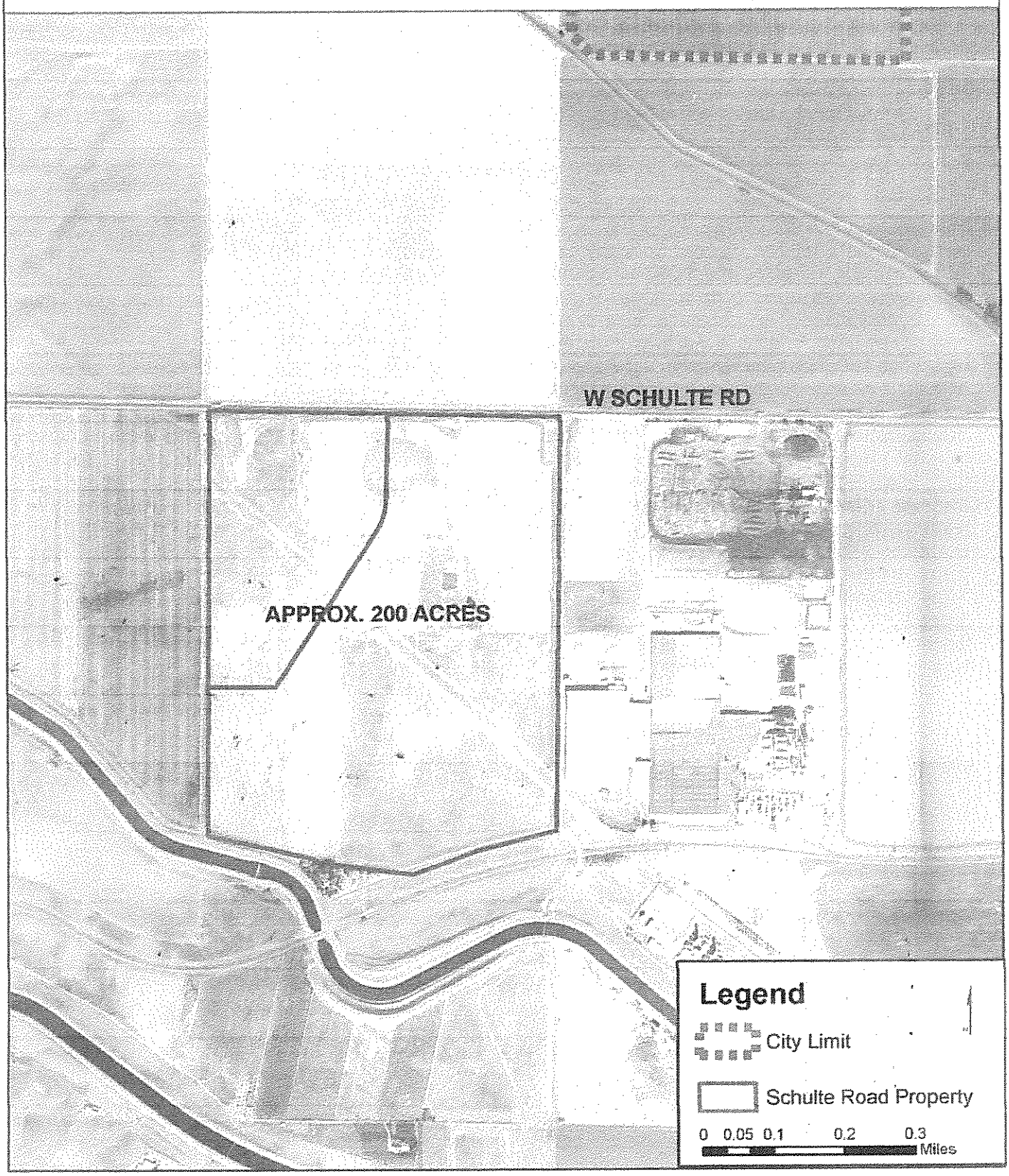
Approved by: R. Leon Churchill, Jr., City Manager

ATTACHMENT

Attachment A: Site Map

Schulte Road Property
Location Map

Attachment A



RESOLUTION 2013- _____

APPROVING A PURCHASE AND SALES AGREEMENT WITH SURLAND COMMUNITIES LLC FOR THE DISPOSITION OF 150 ACRES OF THE CITY-OWNED 200- ACRE SCHULTE ROAD SITE (APN 209-230-30) AND AUTHORIZING THE MAYOR TO EXECUTE THE AGREEMENT

WHEREAS, The Schulte Road property is approximately 200 acres in total and is located on the south side of Schulte Road, west of Lammers Road, and

WHEREAS, On May 21, 2013, Council directed staff to begin negotiations with Surland Communities LLC ("Surland") to purchase and/or lease the 200-acre Schulte Road site, and

WHEREAS, The City and Surland have been negotiating a Purchase and Sales Agreement for 150 acres of the 200-acre Schulte Road site, and

WHEREAS, The 150 acres Surland is purchasing is subject to restrictions that the property be used for educational and/or recreational purposes. However, Congressional legislation authorizes the removal of the use restrictions and reversionary rights on the 150 acres in exchange for the City paying the General Services Administration ("GSA") fair market value for the property. GSA has determined that fair market value for the property is $1.6 million. GSA has given the City until November 1, 2013 to pay this amount, and

WHEREAS, The City previously issued a Request for Proposals for the property. Because of the time lines established by GSA for payment for the removal of the use restrictions, the City Council finds that an additional competitive process is not in the City's best interests.

NOW, THEREFORE, BE IT RESOLVED, That City Council approves the Purchase and Sales Agreement with Surland Communities LLC for the disposition of 150 acres of the City-owned 200-acre Schulte Road site (APN 209-230-30) and authorizes the Mayor to execute the agreement.

****

The foregoing Resolution _____ was adopted by the Tracy City Council on the 3rd day of September, 2013 by the following vote:

AYES: COUNCIL MEMBERS:

NOES: COUNCIL MEMBERS:

ABSENT: COUNCIL MEMBERS:

ABSTAIN: COUNCIL MEMBERS:

_____
MAYOR

ATTEST

_____
CITY CLERK

May 21, 2013

AGENDA ITEM 5

REQUEST

PROVIDE DIRECTION ON THE DISPOSITION OF THE CITY-OWNED SCHULTE ROAD PROPERTY

EXECUTIVE SUMMARY

City staff, with assistance from a consultant, has analyzed two solar proposals the City received for the Schulte Road property and has found that both are viable proposals. The City has also received two additional and separate unsolicited proposals regarding the property. An update on the analysis of the two solar proposals from the City's consultant is included in this report. GSA has requested that the City complete the Schulte Road transaction by August 1, 2013. Staff is seeking direction from City Council relative to proceeding.

DISCUSSION

The Schulte Road property is approximately 200-acres in total and is located on the south side of Schulte Road, west of Lammers Road (see Attachment A).

On September 18, 2012, the City Council considered appropriating $1,115,250 from the RSP Fund for costs associated with the removal of use restrictions and Federal reversionary rights on the 150-acre Schulte Road parcel. Council directed staff to request an extension from GSA while the City performed due diligence on the viability of a renewable energy project on the site. GSA did grant a six month extension to the City if the City agreed to pay a $50,000 deposit by November 14, 2012.

On November 7, 2012, City Council approved the appropriation of $50,000 from the Residential Areas Specific Plan (RSP) Fund to be used for the deposit. Council also approved $40,000 from the RSP Fund for necessary consultant services to assess the viability and best options for a renewable energy project on the site including obtaining and evaluation of necessary project development information, development of a Request for Proposals and evaluation of submitted proposals. An RFP was issued for consulting services and in December 2012 URS was the consultant chosen to assist the City.

URS did finalize the Schulte Road Renewable Energy Development Options report in February, 2013. The report stated that several development pathways could be pursued to implement a viable renewable energy project on the Schulte site. An RFP was subsequently issued for project proposals and two proposals were received.

Proposals

Two proposals were received from reputable companies. A complete analysis was performed by URS as to the viability of the proposals. It was found that both proposals would be viable to yield an alternative energy project and financial return for the City. It is important to note that negotiations with a firm have not yet been initiated and therefore a final agreement, including revenue projections, could contain different terms when

presented to City Council for final approval. Additionally, this analysis completes the scope of work by URS.

As a brief summary, the primary basis of comparison for the two prospective developers is a project (both have proposed) on the 50-acres already owned by the City and where the City enters into a Power Purchase Agreement (PPA) with the developer to offset a portion of the City's energy consumption via PG&E's RES-BCT program. The City would receive lease revenue from the developer on a $/acre-year basis on the amount of property needed to execute the project. The City would also benefit from energy savings over time by paying a known electricity rate via the PPA to the developer, which also in theory will hedge against the projected rise in retail electricity costs. The total revenue to the City from a PPA (reduction in current and projected future electricity costs) and ground lease payments from this comparison project alone ranges from $450,000 to $600,000 annually over a 20 year period, which would total 9mil to 12mil respectively. Both bidders' proposals contain indications of interest in making option payments to the City for the opportunity to develop additional projects on the remaining acreage of the site and with additional project stakeholders and off-takers.

Unsolicited Proposals

The City has received two additional and separate unsolicited proposals which are briefly outlined below.

Surland:

Surland Communities has submitted a proposal (Attachment B) to purchase 150-acres of the Schulte Property for $1,100,000 for a potential solar project. The proposal also requests first right of refusal to purchase additional 50 City owned acres at a price of $900,000. It should be noted that the Tracy Municipal Code provides that the disposition of real property shall be by competitive proposals unless the City Council, by resolution, determines other procedures are in the best interest of the City. If the City chooses to sell the property to Surland, the City Council would first have to make such findings.

Energy and Financial Consulting (Excerpts from proposal):

Energy and Financial Consulting has submitted a non-solicited tentative private offering that proposes a turnkey project using a COP (Certificate of Participation) to secure long term, zero down, low cost funding for a 20 MW solar PV "FIT" (Feed In Tariff) project, on 100-acres. When secured, the rate should be approximately 3.55% for 20 years (final cost is set at offering time). The proposal states that the City's margin would be guaranteed from the utility, by means of a FIT agreement, for up to 25 years.

This proposal claims to ensure that all costs including the land purchase (150 acres), operations and maintenance, fees, interconnection to the grid, annual insurance costs and total revenues would be defined in advance and covered in the agreement. The utility FIT agreement would require the solar company to guarantee the system performance for up to 25 years. The project proposal assumes typical energy production for this size of system in this geographic location. Variables that could raise or lower the energy production (1% to 2%) include maintenance schedule and type, weather, sunlight and shading. The cost of the project would be approximately $50,000,000. The City should realize an estimated profit of $20,516,895 over the 25 year term of the "FIT"

agreement. It was noted, that substantially more revenue might be realized under a potential Power Purchase Agreement structure, which would have to be further explored.

The annual revenue varies by year with a majority of the profit realized in years 21 to 25. After the 25 years, the City could start using the energy created to offset the city's facility energy bills, via "virtual net metering". This could add up to many more millions of dollars over the remaining 5 to 15 year life of the solar PV system. After the system is no longer financially viable, the city would have the scrap value of the modules and redevelop or repurpose the 100-acres.

Next Steps

Following is the current schedule which may change based upon Council direction:

Update GSA on Council direction	5-28-13
Proceed with negotiations and development of an agreement	5-28-13
City Council considers purchase of property and approval of an agreement	7-2-13
Update GSA on City Council action of 7-2-13	7-8-13
Property transaction completed	8-1-13

Staff requests that the City Council provide direction relative to proceeding. Three options are listed below for Council consideration and other options may be presented by City Council as well:

Option 1:
Direct staff to bring back a staff report authorizing the City to pay for costs associated with the removal of use restrictions and Federal reversionary rights on the 150-acre Schulte Road parcel. Given the viability projections of a successful solar project, coupled with the proposal from Surland Communities that would essentially guarantee full reimbursement for the 150-acres at a minimum, staff believes this is the best option at this time. This option would allow the City to further define the highest and best use for the property. If City Council chooses this option, staff will request that GSA immediately perform the appraisal on the 150-acres and bring back the appropriate staff report.

Option 2:
Direct staff to begin negotiations with Surland Communities for sale of the property. This option will allow for further vetting of the deal points and may allow staff to potentially present a purchase agreement on July 2, 2013 concurrently with request to authorize purchase of the 150-acres from GSA. This option will limit the City's option for further development of the 150-acre site however, the funds necessary to remove the restrictions on the property could be utilized for other City purposes.

Option 3:
Direct staff to begin negotiations with one or more of the solar companies. This option will allow for a solar project on the property. Developing a solar project on the property would limit the City's ability for an alternate project on the site. Since there are multiple proposals for the site it is possible for the City to negotiate with more than one potential developer. This option would require a solar consultant in order to assist the negotiations

and final agreements. If City Council chooses this option, staff will bring back a request for additional consultant services and begin negotiations.

STRATEGIC PLAN

This agenda item supports the City Council approved Organizational Efficiency Strategy;
Goal 1: Advance City Council's Fiscal Policies
1. To change the City's organizational and fiscal structure, and
2. To take advantage of funding and revenue generation opportunities

FISCAL IMPACT

There is no fiscal impact for this report. $50,000 has been previously paid to fulfill the request from GSA for a deposit. This amount is refundable in the event the City does not move forward with completing the acquisition of the Schulte Road property. $9,500 has been paid as a deposit for costs associated with previous and future appraisals. An appraisal is scheduled to be completed by GSA and the final acquisition price will be determined at that time.

RECOMMENDATION

Staff recommends that City Council provide direction on the Schulte Road Solar Project as stated in Option 1.

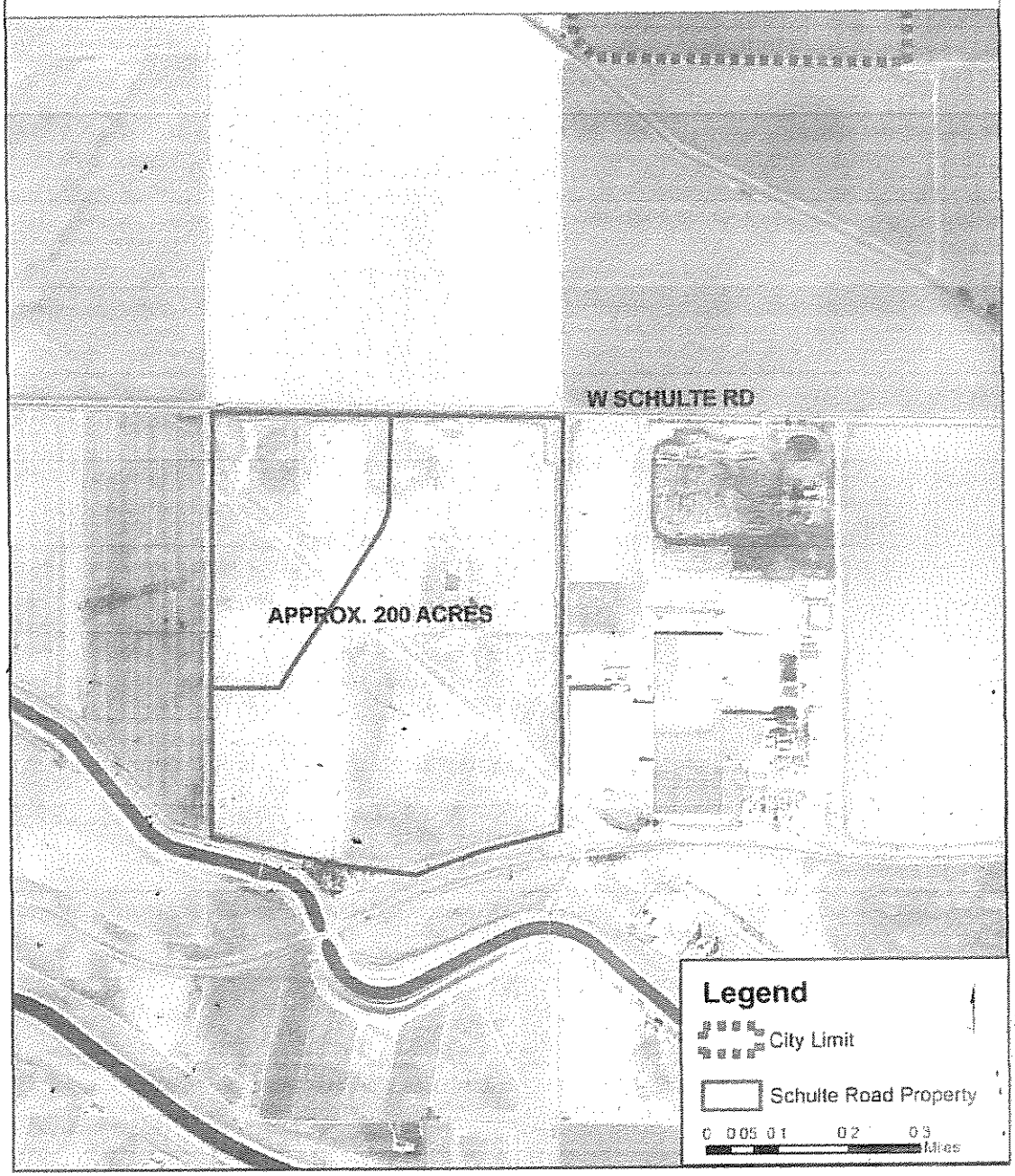
Prepared by: Rod Buchanan, Interim Director of Public Works
Reviewed by: Maria A. Hurtado, Assistant City Manager
Andrew Malik, Development Services Director
Kuldeep Sharma, City Engineer
Approved by: R. Leon Churchill, Jr., City Manager

Attachments:

Attachment A: Map of Schulte Road Property
Attachment B: Surland Proposal

Schulte Road Property

Location Map - Attachment A



ATTACHMENT "B"

THE SURLAND COMPANIES

May 8, 2013

Mr. Leon Churchill
City Manager
City of Tracy
333 Civic Center Plaza
Tracy, California 95376

Re: Letter of Intent Regarding 200 Acres Located near Tracy, California, Assessor's Parcels Numbered 209-230-29 (50 acres) and 209-230-30 (150.18 acres)

Dear Mr. Churchill:

1024 CENTRAL AVE.
TRACY
CALIFORNIA
95376
TELEPHONE
(209)832-7980
FACSIMILE
(209)832-9780
WEBSITE
www.surlandcompanies.com

This letter ("**Letter**") states the intent by which Surland Communities ("**Buyer**") would propose to negotiate an agreement ("**Purchase Agreement**") granting Buyer the right to purchase the real property described above ("**Property**") from the City of Tracy ("**Seller**"). This letter is a statement of proposal of Buyer and is intended to be used to allow City to determine its interest and authorize entering into a formal Purchase Agreement.

Buyer intends to pursue the approval, development, and operation of a Solar Farm on the Properties.

The following are the basic terms and conditions under which the Buyer proposes to Seller to negotiate a Purchase Agreement for the Properties.

Section 1. **Parties and Properties.** This Letter assumes the Seller is or will be the fee owner of the Properties and has the legal authority to enter into the Purchase Agreement for the sale, or other agreement(s) regarding the Properties. The Properties consist of two parcels located in the County of San Joaquin, near the City of Tracy, Property I described as Assessor's parcel no. 209-230-29 consisting of approximately 50 acres, and Property II described as Assessor's parcel no. 209-230-30 consisting of approximately 150.18 acres. The properties presently consist of bare land.

Section 2. **Purchase Price.** The Purchase price of the Property II shall be $1,100,000.

Section 3. **Close of Escrow.** The Close of Escrow ("Escrow") shall occur within 90 days of restrictions being removed, annexation of both Properties I and II to the City with acceptable pre-zoning, subject to, among other factors, an insurable title report including only exceptions to title acceptable to Buyer.

Section 4. **Payment of Purchase Price.** The Purchase Price of Property II shall be paid through escrow at the Close of Escrow.

Section 5. **Purchase Price.** Buyer shall have the right to Purchase Property I for $900,000.

Section 6. **Close of Escrow.** The Close of Escrow ("Escrow") shall occur within 90 days of Buyer notice to Seller. Subject to among other factors, an insurable title report including only exceptions to title acceptable to Buyer.

Section 7. **Payment of Purchase Price.** The Purchase Price of Property I shall be paid through escrow at the Close of Escrow.

Section 8. **Development.** Buyer will have the right to construct, operate, and maintain a Solar Farm on Property I, with the primary intent to serve power to the City of Tracy.

I appreciate your consideration and look forward to your response.

Sincerely,

Les Serpa
CEO
Surland Communities

WILSON IHRIG & ASSOCIATES
ACOUSTICAL AND VIBRATION CONSULTANTS

CALIFORNIA NEW YORK WASHINGTON

6001 SHELLMOUND STREET
SUITE 400
EMERYVILLE, CA 94608
Tel: 510-658-6719
Fax: 510-652-4441
www.wiai.com

20 August 2013

Diane G. Kindermann Henderson, Esq.
Abbott & Kindermann, LLP
2100 21st Street
Sacramento, California 95818

Dear Ms. Kindermann Henderson,

This letter reports our assessment of low-frequency mechanical noise at 540 Winston Court in Tracy, California, the residence of Mr. and Mrs. Brian Van Lehn, and the surrounding neighborhood. The purpose of the assessment is to try to assess and account for the noise disturbance the Van Lehns have reportedly been experiencing over the past several years since the neighboring Leprino Foods plant was expanded and enlarged. As described to us by the Van Lehns, one of the primary ramifications of the noise has been a regular disruption of their ability to sleep through the night.

Our analysis of calibrated noise recordings made at 540 Winton Court and other neighboring properties has identified two strong, low frequency tones which would account for the reported disturbance. In this report, we will explain why the tonal noise is disturbing and annoying, as well as why the simple, A-weighted noise level measurements that were done previously in other prior studies may have failed to identify the problem.

While the exact source of the noise is unknown at this point, it is likely caused by mechanical equipment at the Leprino Foods processing plant. For reasons based on both the sound data and observations made by the Van Lehns, we conclude that the source is mechanical equipment serving the building itself, not the refrigerated rail cars that are often stored behind the plant. The acoustical analysis data provides identifying information about the source of the disturbance which would make exact identification of the equipment relatively simple.

BACKGROUND

Leprino Foods operates a processing plant behind the homes on Winston Court and Colony Drive. Previous noise measurements sponsored by the City of Tracy and Leprino Foods have concluded that the noise level generated by Leprino operations are less than the 67 dBA allowed by a Noise Exemption Application approved by the City. The major identifiable noise sources at the Leprino plant are diesel-engine powered refrigeration rail cars, building HVAC and other mechanical systems.

ACOUSTICAL MEASUREMENTS

Sound is the propagation of mechanical pressure waves through a physical medium, most commonly air. When the pressure waves hit a person's eardrum, the mechanical energy of the wave is converted into what we perceive as sound. The pressure waves can have different frequencies, and the relative amplitudes at the various frequencies are what give different sounds their distinct characteristics. A bird call sounds like a bird call because of its particular frequency content.

The unit of frequency is the Hertz (Hz), 1 Hertz = 1 cycle/second. Humans can typically hear sounds between 20 and 20,000 Hz, but they don't hear all frequencies equally well. Human hearing is most acute between the frequencies of 1,000 and 6,000 Hz. At higher and lower frequencies, human hearing not as good, so people tend to judge these frequencies as quieter than frequencies in the acute range even when the decibel level is equal. At low frequencies, people often confuse sound with perceptible vibration.

Experiments to quantify the human ability to hear different frequencies were conducted in the early part of the last century. In 1930s, this work culminated in the A-weighting curve that filters the different frequencies in a manner similar to the human ear. Low and high frequencies are discounted, while frequencies between 1,000 and 6,000 Hz are boosted slightly. After the frequencies have been filtered by the A-weighting curve, the remaining sound energy may be summed to obtain a single number decibel level that is intended to correlate well with human perceptions of loudness. This single number, A-weighted decibel level is denoted by "dBA", where the "A" represents the A-weighting.

A very common means to analyze the frequency content of a sound is by 1/3-octave bands. This analysis resolves the sound into bands on a logarithmically spaced scale. This is similar to the piano scale, but whereas there are eight musical notes in each octave, the acoustical analysis only uses three bands per octave.

Another common way to analyze the frequency content of a sound is by narrowband analysis. In this analysis, the frequencies are resolved into equally spaced bins, typically 1 Hz wide. This analysis is useful for determining the exact frequency of a tonal noise.

For this investigation, Wilson Ihrig provided the resident of 540 Winston Court, Mr. Brian Van Lehn, with calibrated audio recording equipment consisting of a Brüel & Kjær Model 2230 Type 1 Sound Level Meter and a Sony PCM-M10 digital recorder. The equipment was calibrated with a Brüel & Kjær Model 4230 Field Calibrator immediately prior to deployment; the signal of the Field Calibrator is itself traceable to the National Institute of Standards and Technology (NIST) though an annual calibration verification process.

Mr. Van Lehn was shown how to turn on and operate the equipment to make recordings. Upon retrieving the equipment, Wilson Ihrig downloaded the recordings and analyzed them.

Figure 1 shows two 1/3-octave band spectra obtained in the master bedroom of 540 Winston Court with the windows *closed* on April 8, 2013. Both of these spectra show sound levels averaged over

several minutes of time. The one at 5:04 AM does not contain any unusual components and sounds like the typical ambient in a suburban home.

In contrast, the spectrum at 5:14 AM contains a very strong tone about midway between the 40 and 50 Hz 1/3-octave bands (the ones between 31.5 and 63 Hz – only the main octave bands are labeled). The 50 Hz band level, 58 dB, is more than 20 decibels higher than the adjacent 63 Hz band level; and the 40 Hz band level is more than 10 dB higher than the adjacent 31.5 Hz band level. In general, when a tonal noise level exceeds the neighboring bands by more than 5 dB, it becomes distinctly audible and potentially annoying and disturbing. It is somewhat rare to have a tonal noise in a residence that is 20 dB higher than an adjacent band.

While this level analysis provides a strong indication that the tonal noise will be annoying and disturbing, it does not capture another element of the problem which is that the low frequency sound waves are imparting sufficient force on the home that they cause the windows and possibly the structure itself to vibrate. This is clearly audible in the recordings which could be played back to City officials or Leprino Foods representatives.

The source of the noise is clearly mechanical equipment as it can be heard starting and stopping in the recordings. Figure 2 shows the level in the 50 Hz 1/3-octave band over a 30 minute period on the morning of April 8, 2013. To be clear, whereas Figure 1 shows the spectra at frequencies in the 12.5 to 5,000 Hz bands averaged over several minutes, Figure 2 shows only the level in the 50 Hz band over a period of about 30 minutes. Initially, when the rumble sound is present, the level is about 60 dB. When the equipment shuts off for a few minutes, the 50 Hz sound level drops to 33 to 40 dB. Then, the machinery starts up again, the levels rise to near 60 dBA again, and the rumble and rattling are again clearly audible.

Figure 3 shows outdoor spectra at 540 Winston Court at various dates and times when the strong 40/50 Hz tone was present. These spectra establish that the tone occurs regularly. This figure also shows strong tone in the 80 Hz band (the one to the right of the 63 Hz band). This may be a harmonic of the 40/50 Hz tone or it may have a separate source. As this tone is also often 10 dB higher than the adjacent bands, it by itself would is potentially disturbing and annoying.

Figure 4 shows a limited amount of data collected at other residences in the neighborhood. These exhibit the 80 Hz tone, but not the 40/50 Hz tone. However, the 80 Hz tone is generally stronger in these spectra than it is in the Figure 3 spectra. These data substantiate that the Leprino plant generates tonal noises throughout the Colony Drive and Winston Court neighborhood.

DISCUSSION

Numerous studies document that A-weighted decibel readings often fail to adequately identify noise problems when low frequency noises are involved. In *Guidelines for Community Noise* by the World Health Organization, the general shortcoming of A-weighted noise levels is noted:

> Thus, current practice is to reduce the assessment of environmental noise to a small number of quite simple quantities that are known to be reasonably well related to the effects of noise on people [e.g., A-weighted decibels]. These simple measures have the distinct advantage

> that they are relatively easy and inexpensive to obtain and hence are more likely to be widely adopted. On the other hand, they may ignore some details of the noise characteristics that relate to particular types of effects on people.

"Some details of the noise characteristics" include, among other things, low frequency content. For example, one study compared noise with a peak at 250 Hz to that of a noise at 100 Hz and found that – at the same A-weighted level – the noise with the lower frequency tone was more annoying. The study concluded that, in general, A-weighted noise levels underestimate annoyance for sounds below 200 Hz. (Persson et al, 1985)

Other studies investigated the effect of low frequency content by comparing the C-weighted noise level with the A-weighted noise level. For the purposes of this discussion, it suffices to know that C-weighting does not de-emphasize the 40, 50, or 80 Hz 1/3-octave bands nearly as much as A-weighting.[1] These studies have concluded a C-weighted noise level more than 20 dB greater than the A-weighted level is a good indicator of a low frequency noise problem. (Broner, 1979; Kjellberg et al, 1997). In this matter, the dBC level in the Van Lehn's bedroom is 26 dB higher than the dBA level (based on spectrum in Figure 1; dBC level not shown on figure), a strong indication of the low frequency noise problem there.

A physiological study by Ising and Ising related low frequency noise content with the abnormal secretion of cortisol, thereby affecting a person's normal sleeping patterns. The study used a noise source for which the C-weighted level was 26 dB higher than the A-weighted level (which, coincidentally, is the difference in the Van Lehn's bedroom based on the spectrum in Figure 1), and found that the low frequency noise stimulated the release of cortisol during sleeping hours when cortisol levels would normally be low. (Ising and Ising, 2002). This study concluded that A-weighted noise levels are inadequate for assessing the impact of low frequency noises at night.

The World Health Organization's *Guidelines for Community Noise* also address the adverse effects of noise – including low frequency noise – on sleep:

> Uninterrupted sleep is a prerequisite for good physiological and mental functioning, and the primary effects of sleep disturbance are: difficulty in falling asleep; awakenings and alterations of sleep stages or depth; increased blood pressure, heart rate and finger pulse amplitude; vasoconstriction; changes in respiration; cardiac arrhythmia; and increased body movements. The difference between the sound levels of a noise event and background sound levels, rather than the absolute noise level, may determine the reaction probability.
>
> It should be noted that low-frequency noise . . . can disturb rest and sleep even at low sound pressure levels. When noise is continuous, the equivalent sound pressure level should not exceed 30 dB(A) indoors, if negative effects on sleep are to be avoided. For noise with a large proportion of low-frequency sound a still lower guideline value is recommended.

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[1] The weights of the relevant bands are:

	40 Hz	50 Hz	80 Hz
A-weighting	-34.6 dB	-30.2 dB	-22.5 dB
C-weighting	-2.0 dB	-1.3 dB	-0.5 dB

The first passage points out that the "difference between the sound levels . . . may determine the reaction probability." As can be seen in Figure 2, the increase in sound levels in the 50 Hz band when the tonal noise comes on is the order of 20 dB. In the calibrated audio recording made on that day, the machinery can clearly be heard running, turning off, then turning back on again. In the same manner that the cycling of a hotel air conditioning unit disturbs the sleep of many people, so does the cycling of the Leprino plant low frequency noise disturbs the Van Lehns, a key difference being that the Van Lehns have no control over the situation they are in.

The second WHO passage provides some quantitative on this issue. It notes that for most noises, a limit of 30 dBA is appropriate for good sleep, but "[f]or noise with a large proportion of low-frequency sound a still lower guideline value is recommended." Unfortunately, the document does not provide any additional insight on what the "lower guideline value" might be, but it is very common for noise ordinances and other regulations to weight tonal noises by 5 dB, indicating that 25 dBA would at least be a good starting point. As Figure 1 shows, the noise level in the Van Lehn's bedroom when the tonal noise is present is 32 dBA.

In almost any situation, a tonal noise that exceeds the adjacent frequencies by 20 dB would be deemed highly annoying and disturbing by most people. On that basis alone, many commercial businesses would be compelled to reduce the tonal noise permeating the Winston Court and Colony Drive either through their own "good neighbor policy" or by the City in which they operate.

In this particular case, something associated with the 45 Hz tone sometimes causes the windows at 540 Winston Court to rattle audibly and for the intensity of the sound inside the home to increase perceptibly. It may be that this is caused by a fan at Leprino Foods operating near a stall condition, but that is conjecture at this point. The intensity of the disturbing phenomenon is not conjecture, however, as it is clearly and unmistakably evident in many of the recordings made by Mr. Van Lehn. These could be played back for others to hear for themselves, if desired.

CONCLUSIONS

1. Mechanical equipment in the vicinity of 540 Winston Court is generating a very strong tonal noise in the 40, 50, and 80 Hz 1/3-octave bands. The tones exceed adjacent bands by some 10 to 20 dB which is a strong indication that most people would find them highly annoying.

2. On occasion when the 40/50 Hz tone is present, the windows of 540 Winston Court rattle and the acoustic environment inside the bedrooms becomes particularly intense. The exact physical cause of this has not yet been found, but the phenomenon itself is captured on several calibrated audio recordings made in the home.

3. The A-weighting filter greatly discounts noise at 40, 50, and 80 Hz. Scientific research has determined that A-weighted measurements would be inadequate to properly address the annoyance, disturbance and health effects of this situation where strong tones are present in those frequency bands.

4. Scientific studies have found that a difference of more than 20 dB between dBC noise level and the dBA level was a strong indicator of a low frequency noise problem. This difference has been measured to be 26 dB in the bedroom at 540 Winston Court.

5. One scientific study has found that normal sleep patterns can be disrupted by abnormal cortisol secretion when the dBC level exceeds the dBA level by 26 dB (as it does in the bedroom at 540 Winston Court).

6. The World Health Organization, based on decades of research, recommends a noise limit in bedrooms lower than 30 dBA when a large proportion of low frequency sound is present. We take this to mean 25 dBA, if not lower. The noise level in the bedroom at 540 Winston Court when the strong 40/50 Hz tone is present is 32 dBA.

7. Though the exact source of the mechanical noise has not been identified, mechanical noise of this nature could be readily abated by standard noise control equipment and design techniques.

* * * * *

Please contact us if you have any question about these acoustical measurements or our analysis.

Very truly yours,

WILSON, IHRIG & ASSOCIATES, INC.

Derek L. Watry

Derek L. Watry
Principal

References

1. Broner, N. (1979), *Low frequency noise annoyance*, Ph.D. thesis, Chelsea College, University of London.

2. Ising, H. and M. Ising (2002), "Chronic cortisol increases in the first half of the night caused by road traffic noise", *Noise and Health*, No. 4, 13-21.

3. Kjellberg, A., M. Tesarz, K. Holberg, and U. Landström (1997), "Evaluation of frequency-weighted sound level measurements for prediction of low-frequency noise annoyance", *Environment International*, No. 23, 519-527.

4. Leventhall, G., Ph.D. (May 2003), *A Review of Published Research on Low Frequency Noise and its Effects*, Report EPG 1/2/50 prepared for The Department for Environment, Food, and Rural Affairs, Nobel House, London.

5. Persson, K., M. Björkman, and R. Rylander (1985), "An experimental evaluation of annoyance due to low frequency noise", *J. of Low Freq Noise & Vibration*, No. 4, 145-153.

6. World Health Organization (April 1999), *Guidelines for Community Noise*, edited by B. Berglund, T. Lindvall, and D. H. Schwela, Geneva, Switzerland.

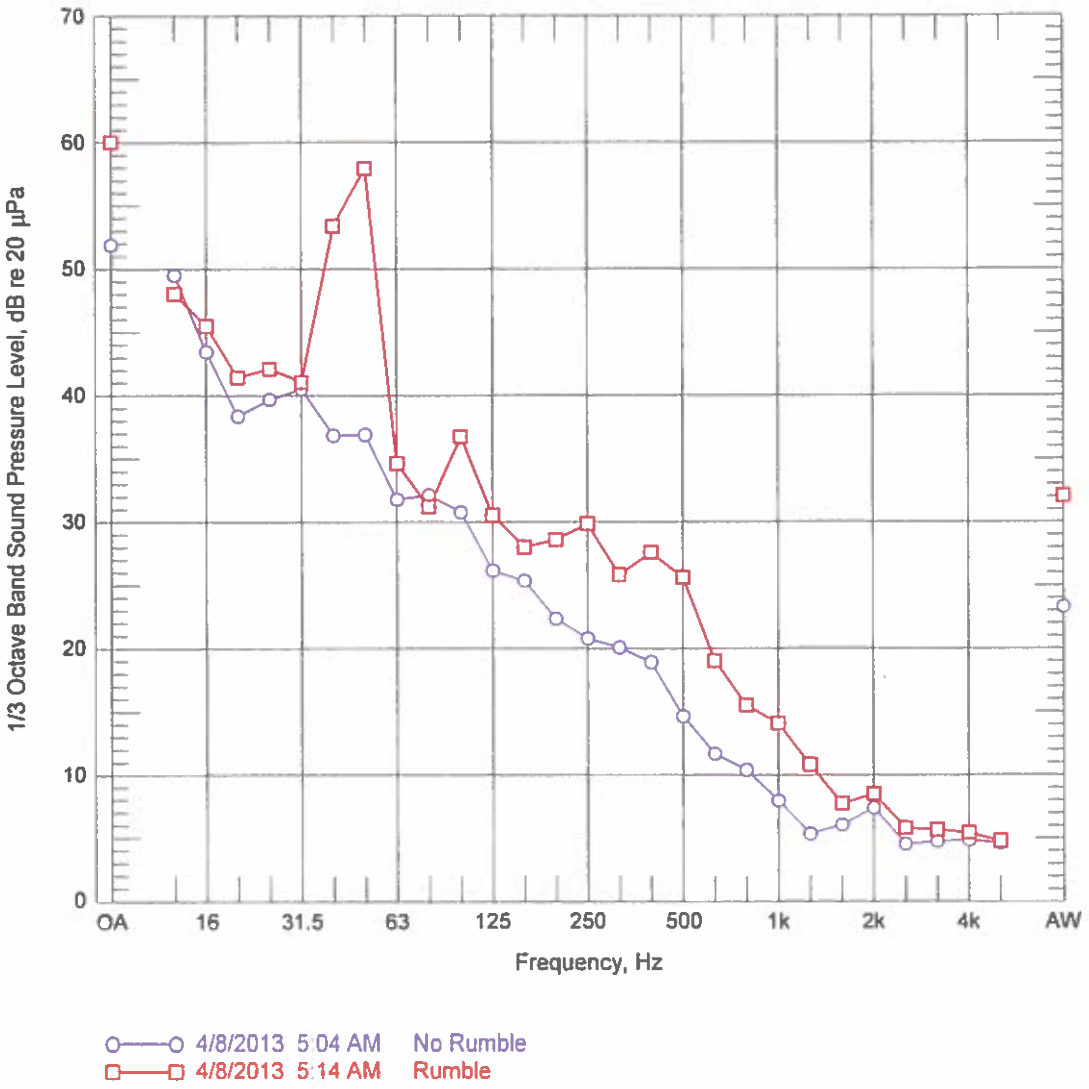

FIGURE 1 RUMBLE IN MASTER BEDROOM, 540 WINSTON CT.

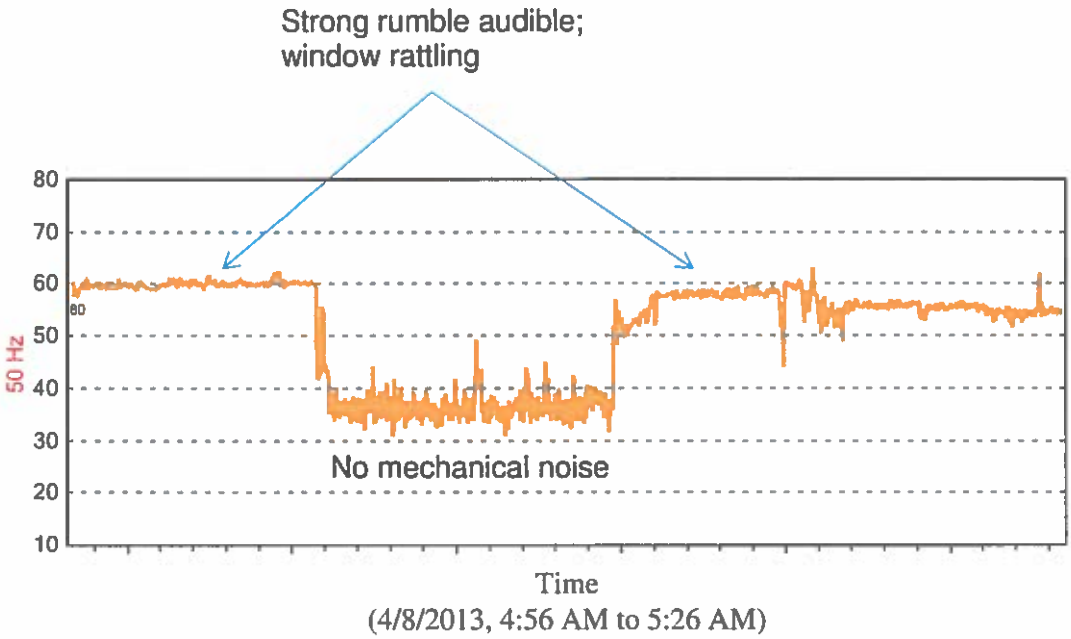

FIGURE 2 SOUND LEVEL IN 50 Hz 1/3-OCTAVE BAND
(Vertical scale in dB)

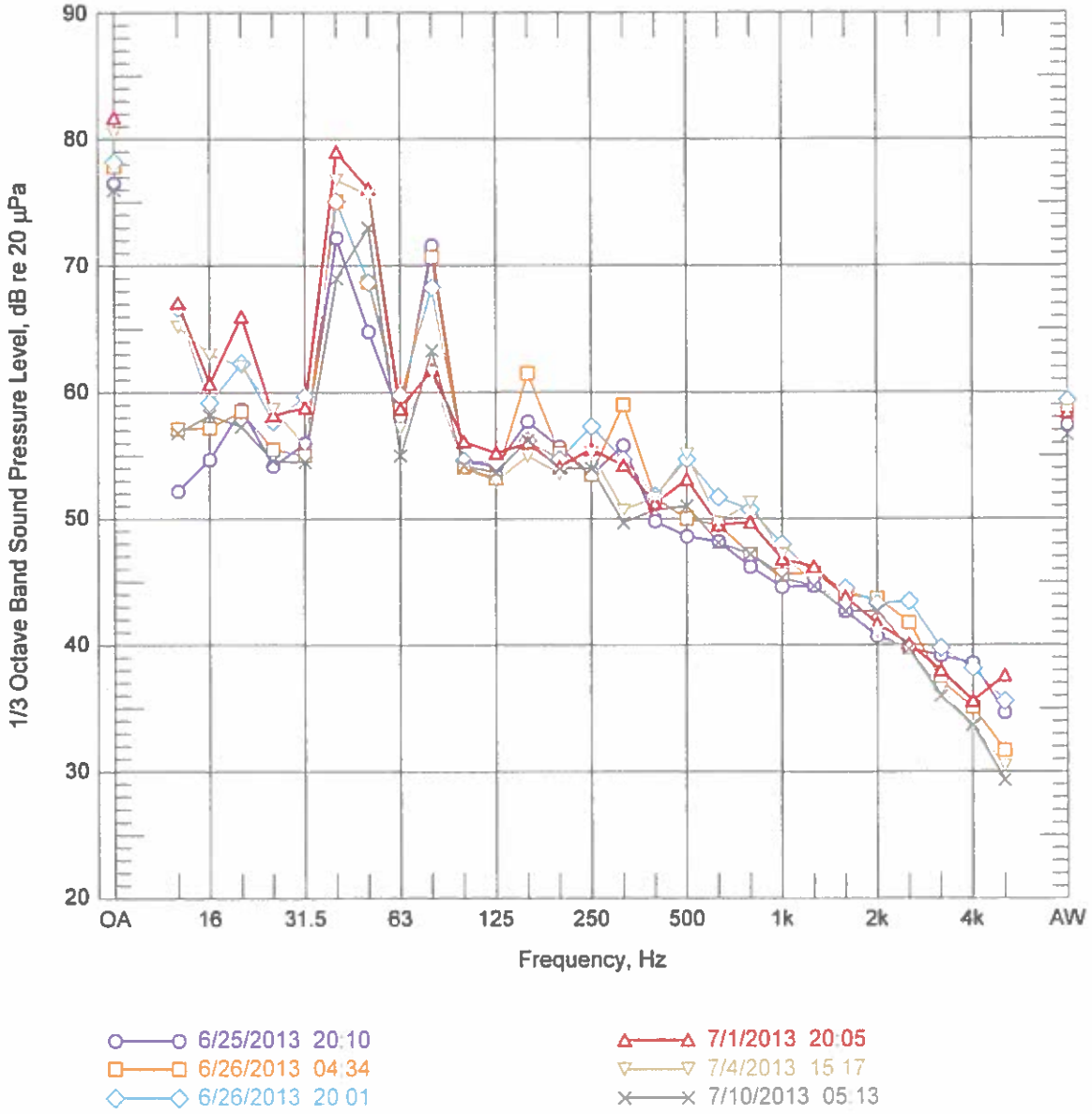

FIGURE 3 RECORDINGS AT 540 WINSTON CT ON VARIOUS DAYS

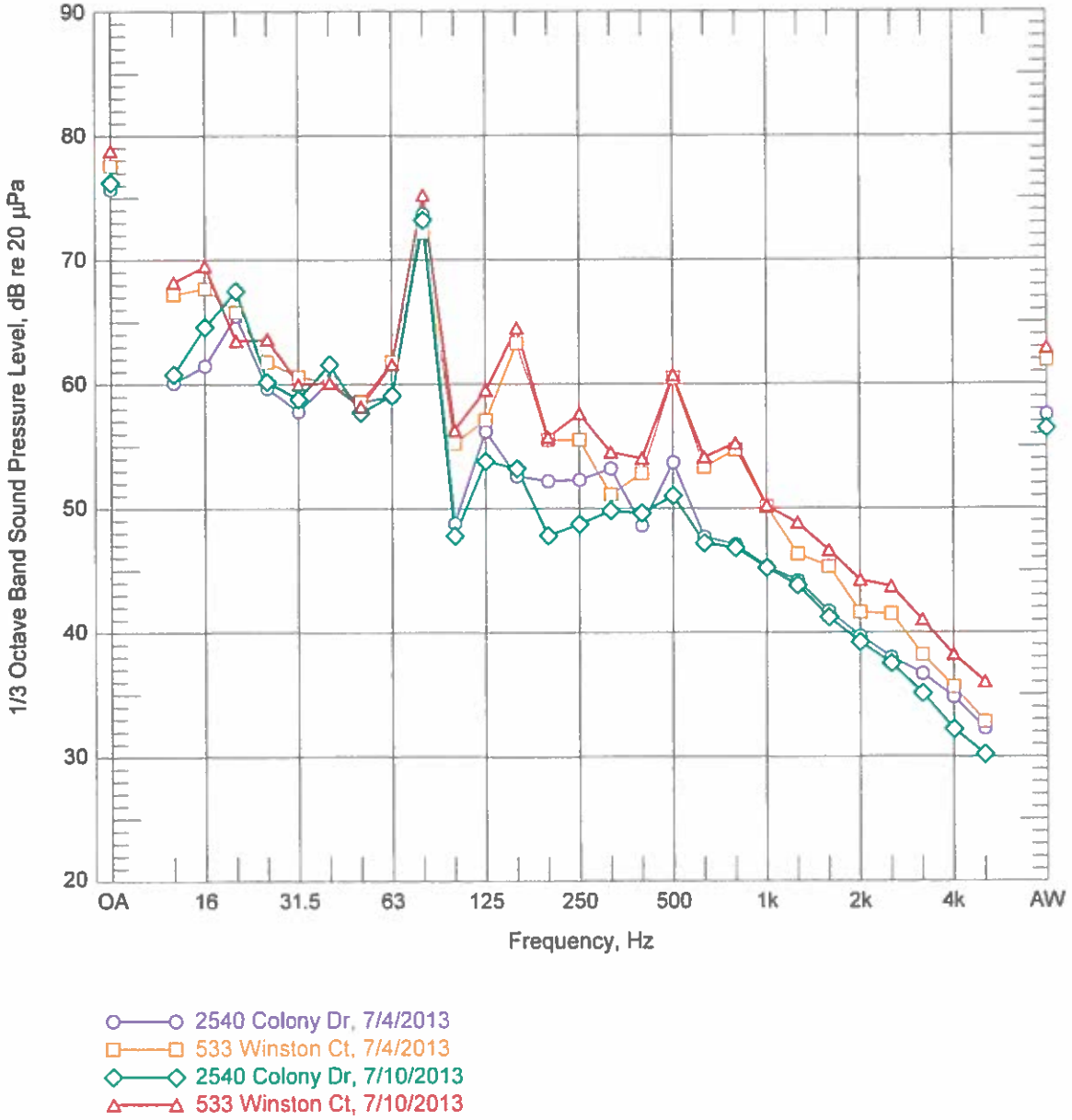

FIGURE 4 RECORDINGS AT OTHER RESIDENCES

Brian

From: "Fitbit" <noreply@fitbit.com>
To: <bvl1@comcast.net>
Sent: Tuesday, October 08, 2013 4:56 AM
Subject: Your weekly progress report from Fitbit!

fitbit

Weekly Stats

Hi Brian, here are your weekly stats.

9/30/2013 to 10/06/2013

WEEK'S MOST ACTIVE DAY
Sat, Oct 5

WEEK'S LEAST ACTIVE DAY
Mon, Sep 30

TOTAL STEPS
80,444
DAILY AVERAGE
11,492 steps
BEST DAY
15,388 steps

TOTAL DISTANCE
37.39 miles
DAILY AVERAGE
5.34 miles
BEST DAY
7.15 miles

TOTAL CALS BURNED
22,319
DAILY AVERAGE
3,188 cals
BEST DAY
3,562 cals

WEIGHT CHANGE
0.0 lb
LIGHTEST
225.0 lb
HEAVIEST
225.0 lb

AVG SLEEP DURATION
5 hrs **59** min
AVG TIMES AWAKENED
21
AVG TIME TO FALL ASLEEP
0hrs 7min

Last week's step winners

1 Brian YOU
80,444 steps

2 Lia
65,423 steps

3 LeAnn
50,927 steps

See current leaderboard

Last week's badges

5000 10,000 15,000

See all of my badges

What's the buzz?

Brian

From: "Fitbit" <noreply@fitbit.com>
To: <bvl1@comcast.net>
Sent: Monday, October 14, 2013 10:41 PM
Subject: Your weekly progress report from Fitbit!

Hi Brian, here are your weekly stats.

10/07/2013 to 10/13/2013

WEEK'S MOST ACTIVE DAY
Fri, Oct 11

WEEK'S LEAST ACTIVE DAY
Sat, Oct 12

TOTAL STEPS
75,697
DAILY AVERAGE
10,814 steps
BEST DAY
13,412 steps

TOTAL DISTANCE
35.18 miles
DAILY AVERAGE
5.03 miles
BEST DAY
6.23 miles

TOTAL CALS BURNED
21,888
DAILY AVERAGE
3,127 cals
BEST DAY
3,359 cals

WEIGHT CHANGE
0.0 lb
LIGHTEST
225.0 lb
HEAVIEST
225.0 lb

AVG SLEEP DURATION
6 hrs **23** min
AVG TIMES AWAKENED
22
AVG TIME TO FALL ASLEEP
0hrs 7min

Last week's step winners

1 **Brian** 75,697 steps
2 **LeAnn** 56,957 steps
3 **Lia** 51,820 steps

See current leaderboard

Last week's badges

See all of my badges

What's the buzz?

Brian

From: "Fitbit" <noreply@fitbit.com>
To: <bvl1@comcast.net>
Sent: Monday, October 21, 2013 11:48 PM
Subject: Your weekly progress report from Fitbit!

Hi Brian, here are your weekly stats.

10/14/2013 to 10/20/2013

WEEK'S MOST ACTIVE DAY
Wed, Oct 16

WEEK'S LEAST ACTIVE DAY
Sun, Oct 20

TOTAL STEPS
78,933
DAILY AVERAGE
11,276 steps
BEST DAY
13,376 steps

TOTAL DISTANCE
36.69 miles
DAILY AVERAGE
5.24 miles
BEST DAY
6.22 miles

TOTAL CALS BURNED
22,199
DAILY AVERAGE
3,171 cals
BEST DAY
3,373 cals

WEIGHT CHANGE
0.0 lb
LIGHTEST
225.0 lb
HEAVIEST
225.0 lb

AVG SLEEP DURATION
6 hrs **18** min
AVG TIMES AWAKENED
20
AVG TIME TO FALL ASLEEP
0hrs 10min

Last week's step winners

1 **Brian** 78,933 steps
2 **LeAnn** 50,623 steps
3 **Lia** 30,266 steps

See current leaderboard

Last week's badges

See all of my badges

What's the buzz?

Brian

From: "Fitbit" <noreply@fitbit.com>
To: <bvl1@comcast.net>
Sent: Monday, October 28, 2013 10:43 PM
Subject: Your weekly progress report from Fitbit!

Hi Brian, here are your weekly stats.

10/21/2013 to 10/27/2013

WEEK'S MOST ACTIVE DAY
Tue, Oct 22

WEEK'S LEAST ACTIVE DAY
Sat, Oct 26

TOTAL STEPS
74,941

DAILY AVERAGE
10,706 steps
BEST DAY
13,512 steps

TOTAL DISTANCE
34.83 miles

DAILY AVERAGE
4.98 miles
BEST DAY
6.28 miles

TOTAL CALS BURNED
21,821

DAILY AVERAGE
3,117 cals
BEST DAY
3,402 cals

WEIGHT CHANGE
0.0 lb

LIGHTEST
225.0 lb
HEAVIEST
225.0 lb

AVG SLEEP DURATION
6 hrs **30** min

AVG TIMES AWAKENED
23
AVG TIME TO FALL ASLEEP
0hrs 9min

Last week's step winners

1 **Brian** 74,941 steps

2 **Lia** 37,805 steps

3 **LeAnn** 37,527 steps

See current leaderboard

Last week's badges

See all of my badges

What's the buzz?

Brian

From: "Fitbit" <noreply@fitbit.com>
To: <bvl1@comcast.net>
Sent: Monday, November 04, 2013 9:25 PM
Subject: Your weekly progress report from Fitbit!

Hi Brian, here are your weekly stats.

10/28/2013 to 11/03/2013

WEEK'S MOST ACTIVE DAY
Sat, Nov 2

WEEK'S LEAST ACTIVE DAY
Mon, Oct 28

TOTAL STEPS
111,640
DAILY AVERAGE
15,949 steps
BEST DAY
23,112 steps

TOTAL DISTANCE
51.89 miles
DAILY AVERAGE
7.41 miles
BEST DAY
10.74 miles

TOTAL CALS BURNED
24,815
DAILY AVERAGE
3,545 cals
BEST DAY
4,165 cals

WEIGHT CHANGE
0.0 lb
LIGHTEST
225.0 lb
HEAVIEST
225.0 lb

AVG SLEEP DURATION
6 hrs **8** min
AVG TIMES AWAKENED
23
AVG TIME TO FALL ASLEEP
0hrs 8min

Last week's step winners

1 **Brian** 111,640 steps
2 **Lia** 66,031 steps
3 **LeAnn** 65,058 steps

See current leaderboard

Last week's badges

See all of my badges

What's the buzz?