

February 13, 2012

**MEMORANDUM**

**TO:** Dave Anderson, Engineering Manager  
DEQ - Twin Falls Regional Office

Bill Allred, Regional Administrator  
DEQ - Twin Falls Regional Office

**FROM:** Adam Bussan E.I., Scientist 3 **ALB**  
DEQ - Technical Services

**SUBJECT:** Staff Analysis for Draft Reuse Permit WRU M-0076-04 (formerly LA-000076-04) -  
(Municipal Recycled Water)  
City of Wendell

**1. PURPOSE**

The purpose of this memorandum is to satisfy the requirements of the *Recycled Water Rules*, IDAPA 58.01.17.400.05, for issuing reuse permits. This memorandum addresses draft permit WRU M-0076-04, for the municipal treatment and reuse system, owned and operated by the City of Wendell. The City of Wendell's treatment and reuse system is currently permitted under the terms of Reuse Permit LA-000076-03.

**2. SUMMARY OF EVENTS**

The Department of Environmental Quality (DEQ) issued Permit LA-000076-03 to the City of Wendell on June 29, 2007. The permit is for continued operation of the recycled water treatment and reuse system serving the City of Wendell. The mailing address for this facility is: P.O. Box 208, Wendell, ID, and it is located in Township 8 South, Range 15 East, Section 5. The purpose of the current draft permit is to renew Permit LA-000076-03, which will expire on June 29, 2012.

A permit renewal application was received from the City of Wendell on January 19, 2012, and largely serves as the basis for the terms and conditions contained in the draft permit. The draft permit will be presented for a public comment period as required by the *Recycled Water Rules*. After the comment period has closed, DEQ will provide written responses to all relevant comments and prepare a final permit for the City of Wendell's wastewater reuse facilities.

On May 11, 2006 DEQ issued a Notice of Violation (NOV) for non-compliance with the land application permit LA-000076-02. The South and West Sites were marginally suitable for wastewater reuse application when permitted, and were made even less suitable when high coliform counts required greater buffer zone setbacks, further reducing the area available for application at the sites. Violations of the permit included exceedance of the maximum phosphorus loading application rates and non-growing season maximum hydraulic loading rates at both sites (South and West). Buffer zones were violated and monitoring requirements went unfulfilled during this time as well. The City entered into a Consent Order with DEQ on July 23, 2006 that required a facility plan be submitted to DEQ. Construction is scheduled to begin on wastewater facility improvements that would allow the facility to meet its permit requirements. The current permit, LA-000076-03, was issued anticipating that improvements would be made before the permit expired.

The required wastewater facilities plan was received by DEQ on May 17, 2007. These were followed by the submission of 50% review plans, received by DEQ on January 10, 2012. A number of options were presented in the facilities plan that would return the City to compliance. Ultimately the City decided to purchase a larger application site south of the existing facility and to no longer apply effluent on the South and West Sites. After piping to the land application area is installed, chlorination and pump stations constructed, and runoff collection areas built, the new application site will be ready for use. When the 240 Acre Farm is functional, a new storage lagoon (approximately 27 MG) will be built on the current South Site, MU-076-01. The new storage lagoon will hold enough effluent to allow the facility to eliminate non-growing season application.

The previous records of total coliform measurements indicate that the City of Wendell's treatment facility is operating at a Class D level of disinfection. A Class D system requires that the median total coliform count does not exceed 230/100 mL, and no single sample shall exceed a total coliform count of 2300/100 mL. An upgraded disinfection pipe loop is part of the facility's upgrades, and should decrease the effluent coliform count from previous highs.

The staff analysis issued on May 30, 2007 indicated that high soil phosphorus concentrations were measured on both fields, and had been rising for the preceding five years. This trend has not continued through the most recent 5 years of sampling, though plant available phosphorus concentrations are still high in the soil samples from the West Site, greater than 30 ppm in the top soil layer. Soil ammonia and nitrate concentrations were lower in 2011 than they were in 2007 at both the South and West Sites. Excessive phosphorus loading was one of the reasons for the City's consent order, and was especially an issue at the West Site, which because of its uneven topography had its crops burnt at the end of the growing season instead of being harvested. Burning crops can volatilize nitrogen, but leaves phosphorus bound in the ash residue. The new application site will allow the harvesting of all crops grown on site, which will decrease the chances that soil phosphorus concentrations will become too high.

Inspection reports indicate that solids are starting to build up in Lagoon no.1 and will likely need to be removed in the near future. Seepage tests were performed on the lagoons in 2006 and 2010. In the 2006 test, Lagoon no. 3, the smallest of the facility's five lagoons, was the only lagoon to have a seepage rate measured to be greater than the 0.25 inch/day limit. Future construction activities will remove Lagoon no. 3's connection to the rest of the treatment system.

### **3. PROCESS AND SITE DESCRIPTION**

The City of Wendell's previous permit, LA-000076-03, and the accompanying staff analysis issued on May 30, 2007 can also be referenced for facility descriptions.

#### **3.1 Process**

The City of Wendell operates a Class D municipal wastewater treatment system serving residential and commercial users, currently consisting of a collection system, plant headworks, an aerated lagoon, and three facultative polishing lagoons. Lagoon no. 3 located, adjacent to the active lagoons, will soon be permanently disconnected from the treatment train. After passing through the lagoons, effluent will be chlorinated by an upgraded chlorination system before it is finally pumped to the application sites. A new 27 MG lagoon is planned for construction on the current South Site (MU-076-01). The new lagoon is anticipated to provide sufficient storage to eliminate the need for non-growing season wastewater application.

#### **3.2 Site Description**

A 240 acre field south of the existing facility, located across the road from MU-076-01, was purchased by

the City in 2011 to serve as the exclusive application site for the City's wastewater effluent. The new application site, named 240 Acre Farm, was an active farm before it was acquired by the City. Numerous homes and private wells line the perimeter of the site, especially on its southern edge. Three hundred foot buffer zone setbacks are to be established between the application site and any public access. Private wells, used for human consumption, will be protected by 500 foot buffer zones.

Ground water below the facility, part of the Eastern Snake River Plain Aquifer, generally flows from east to west, with a slight southeastern component, and has a water table 110 feet below the surface. With the application site moving to the south, the existing ground water monitoring network will no longer have full downgradient coverage of all water reuse activities.

A variety of soil types are present at the new site, and are, from most to least prevalent, Taunton-Ticeska Very Fine Sandy Loam, Taunton-Chijer Very Fine Sandy Loams, Chijer Very Fine Sandy Loam, Wendell-Wako-Rekima Complex, Ticeska-Minevo-Taunton Complex. These soils are well drained and have moderate permeability.

Of the 240 acres recently purchased by the City, 108.4 acres are expected to be irrigated by two (2) pivots: the East Pivot irrigating 70.7 acres and the West Pivot irrigating 37.7 acres. Another 92.7 acres is expected to be irrigated by supplemental irrigation water. In the future part of the 92.7 acres may be used for recycled water irrigation as long as the buffer zone distances are maintained for the corresponding effluent disinfection classification (currently Class D). When operation begins at the 240 Acre Farm only one pivot is expected to be used to apply effluent at a time. Each pivot will be set-up to allow irrigation by supplemental water as well. The South Site (MU-076-01) is irrigated by two wheel lines and the West Site (MU-076-02) by a solid set irrigation system.

A five year cropping plan, with 4 years of growing alfalfa rotated with a 1 year planting of barley or corn, was proposed so the productivity of the fields can be maintained. Climatic data from the Jerome monitoring station, part of the Western Regional Climatic Center, was used to determine that a typical year's irrigation water requirement (IWR) for alfalfa is 53.17 inches. For the one year in the cycle when Corn Silage or Barley is grown, the IWR would be reduced to 36.5 inches and 34.7 inches respectively.

#### **4. HYDRAULIC AND NUTRIENT LOADINGS**

In 2011 the facility applied a total of 34.2 MG of effluent, with the previous five years of annual reports revealing a maximum hydraulic loading rate of 52.8 MG in 2009 and a low of 21.69 MG in 2010. These inconsistent results make predicting future hydraulic loading difficult. Instead, expectations of future effluent application volume were made using estimates of monthly influent flow and an evaporation/precipitation balance calculated from regional climatic data. The monthly estimate of influent flow was based on an average daily wastewater influent flow rate of 0.23 MG/day, the 92<sup>nd</sup> percentile average day influent flow measured between 2009 and 2011. Using this method, the volume of effluent that would need to be land applied in 2011 was calculated to be 63.36 MG, which is 29.2 MG greater than the amount of effluent that was reported to have been applied during that year and 10.6 MG greater than the previous five year's high. Despite this discrepancy, it is a helpful starting point for calculating future hydraulic loading rates used in determining the necessary size of the new application area, assuming that influent flow rates will grow at the same 2.25% rate as the served population.

Assuming that inflow to the facility will increase at the same rate as the serviced population, and that evaporation and precipitation will remain constant, 84.25 MG of effluent is projected to be applied in 2021 and 110.35 in 2031. The annual 2.25% growth rate used in these projections is higher than the City's US census reported growth rate over the past decade, suggesting that the design of the application site based on these future hydraulic loadings is conservative. Even if Wendell's pivot irrigation system is maximally efficient, it is not likely the IWR of barley, the least water intensive of the projected crops, would be less than the projected effluent hydraulic loading rate until 2022. When the facility is growing alfalfa, the fields should have sufficient water demand to absorb the volume of applied effluent until at

least 2031. Because corn and barley are less water demanding than alfalfa, the facility will need to be careful after 2021 when growing these crops so that the application sites are not hydraulically overloaded. The hydraulic loading limit is more likely to be exceeded if the installed pivot irrigation system is highly efficient and less likely to be exceeded if Wendell's population growth is less than expected. By the time this permit expires it will be possible to obtain a better understanding of the 240 Acre Farm's capacity to treat the City's wastewater.

Since it is possible that the new storage lagoon will not be completed in time to store winter flows, emergency non-growing season application may be necessary at the site. DEQ notification is required when non-growing season application occurs, and hydraulic application rates must be limited to:

- MU-076-01 – 1.57 MG
- MU-076-02 – 2.31 MG
- MU-076-03 – 8.82 MG
- MU-076-04 – 3.17 MG

The limiting factor in the design of the 240 Acre Farm application sites was providing sufficient land application area to prevent the phosphorus loading limit from being exceeded. Future phosphorus loading rates and crop nutrient uptakes were needed to be calculated before the size of the application sites could be determined. These calculations, which can be found in the planning documents submitted to DEQ, used a historic phosphorus concentration of 3.6 mg/L to estimate the phosphorus loading rates (JUB 2012, 2007). However, effluent phosphorus concentrations measured during the most recent three years of operation have been higher, averaging 5.3 mg/L. If future effluent phosphorus concentrations remain nearer to 5.3 mg/L, the facility may have trouble meeting phosphorus loading limits (150% of crop uptake) if barley is the crop grown on site (see Table 1 for future phosphorus loadings at the different phosphorus concentrations). Should crop uptake of phosphorus be insufficient, the facility would benefit from spreading out the loading by increasing the area of application or by planting corn, which has greater phosphorus uptake than barley, during that part of the cropping rotation.

The USDA reports that normal yields for alfalfa hay in Gooding County are nearly 6 ton/ac, though if alfalfa yields at the 240 Acre Farm are closer to the South Site's previous 5 years' average of 3.5 tons/acre yield, uptake by alfalfa may result in a phosphorus limit less than the expected nutrient loading. Were the new application site to only yield 4 tons/acre alfalfa and effluent phosphorus concentrations stay near 5.3 mg/L, the facility should consider a similar strategy for alfalfa as was recommended for barley. Application sites planted with corn or with alfalfa yielding near 6 ton/acre should not have a problem meeting phosphorus limits until at least 2031.

Effluent with the current concentration of COD is not expected to come close to the 50 lbs/acre/day limit by 2031. Nitrogen loading will likely always be less of a concern than phosphorus loading. It is only when the facility's highest historic concentrations of nitrogen are considered that the necessary acreage to grow sufficient crop to take up nitrogen approaches the area permitted on the Eastern and Western pivots on the 240 Acre Farm.

Table 1: Estimated flows, nutrient loadings and necessary application area

		2011	2016	2021	2026	2031
Estimated Effluent Hydraulic Loading	(MG)	63.4	73.2	84.3	96.6	110.3
<b>3.6 mg/L Phosphorus Effluent Concentration</b>						
Phosphorus loading	(lbs)	1,902	2,199	2,530	2,900	3,313
Barley	(Acre)	58.7	67.9	78.1	89.5	102.3
Corn	(Acre)	43.1	49.9	57.4	65.7	75.1
Alfalfa (4 lbs/acre yield)	(Acre)	67.1	77.5	89.2	102.3	116.9

<b>5.3 mg/L Phosphorus Effluent Concentration</b>						
Phosphorus loading	<b>(lbs)</b>	2,801	3,237	3,724	4,269	4,878
Barley	<b>(Acre)</b>	86.4	99.9	114.9	131.8	150.5
Corn	<b>(Acre)</b>	63.5	73.4	84.4	96.8	110.6
Alfalfa (4 lbs/acre yield)	<b>(Acre)</b>	98.8	114.2	131.4	150.6	172.0
Alfalfa (5.8 lbs/acre yield)	<b>(Acre)</b>	68.1	78.7	90.6	103.8	118.7
<b>12 mg/L Nitrogen Effluent Concentration</b>						
Nitrogen loading	<b>(lbs)</b>	6,320	7,304	8,404	9,633	11,007
Barley	<b>(Acre)</b>	39.0	45.1	51.9	59.5	67.9
Corn	<b>(Acre)</b>	21.2	24.5	28.2	32.4	37.0
Alfalfa (4 lbs/acre yield)	<b>(Acre)</b>	20.9	24.2	27.8	31.9	36.4
<b>16 mg/L Nitrogen Effluent Concentration</b>						
Nitrogen loading	<b>(lbs)</b>	8,455	9,771	11,242	12,887	14,725
Barley	<b>(Acre)</b>	52.2	60.3	69.4	79.5	90.9
Corn	<b>(Acre)</b>	28.4	32.8	37.8	43.3	49.5
Alfalfa (4 lbs/acre yield)	<b>(Acre)</b>	28.0	32.3	37.2	42.6	48.7

Table 1 shows the annual hydraulic and nutrient loadings expected to be produced by the facility for the next 20 years. Phosphorus and nitrogen loadings were calculated for both a lower concentration, which was used as a factor in the loading calculations provided in the permittee's permit application and based on average nutrient concentrations before 2007, and a higher concentration, which is an average of the most recent 3 years' sampling results. Below the loading rates for each of the different concentrations is a calculation of the acreage needed to be planted with each of the prospective crops that will just meet the nutrient's loading limits. Estimated crop nutrient uptake values used in these calculations are as follows: 150% of (108.0 lb/ac N and 21.6 lb/ac P) for barley; 150% of (198.5 lb/ac N and 29.4 lb/ac P) for corn silage; 150% of (201.6 lb/ac N and 18.9 lb/ac P) for alfalfa yielding 4 tons/ac. These crop uptake values were calculated from typical crop yields for Gooding County provided by the USDA: NASS Quick Stats application and typical crop nutrient content referenced by the USDA: NRCS (see references). The hydraulic and nutrient loadings for year 2011 in Table 1 are based on estimated effluent flow rates instead of submitted flow rates, because of irregularities in the previous 5 years' reported hydraulic loading rates and for a more representative comparison with the loading rates in the projected years.

## 5. GROUND WATER

A review of the facility's ground water monitoring from 2007-2011 did not reveal any of the measured constituents to have a noticeable increasing trend. Nitrate concentrations measured in the ground water were between 0.5 and 2.5 mg/L, all below the 10 mg/L primary drinking water standard. Of the downgradient wells, the greatest elevation from upgradient nitrate concentrations was found in Monitoring Well No. 3, which on average had measurements 1 mg/L-N above background levels. Phosphorus concentrations were below the limits of detection in all samples since 2007. During this time period the only measured constituent to exceed its secondary standard was iron.

Wells currently in use for ground water monitoring do not provide sufficient coverage downgradient of the 240 Acre Farm to reliably assess its impacts on ground water. The existing ground water network will need to be modified or extended so that potential impacts to ground water quality can be monitored downgradient from the new application site.

## 6. PERMITTING DISCUSSION

The following sections outline changes made to the terms of the draft renewal permit, based on changes requested by the permittee, evaluations of past performance with previous permit requirements, and/or updates required by changes to the *Recycled Water Rules* or any other applicable regulatory standards. Terms and conditions that are unchanged from the previous permit and remain applicable to the facility are not addressed in this document. Changes made to update language and regulatory references are also not addressed in this document.

6.1 Section D. Facility Information

Nearest Surface Water An irrigation lateral is almost immediately adjacent to the 240 Acre Farm, though even with surface water is now closer to the irrigation site than it was to the previous application sites, the buffer zones incorporated into the design of the 240 Acre Farm are greater than the minimum necessary from a surface water body.

Section E. Compliance Schedule for Required Activities

Table 2 summarizes the status of compliance activities of the current permit LA-000076-03. Proposed activities for WRU M-0076-04 are described individually below the table.

Table 2: LA-000076-03 Compliance Activity Status Summary

Activity Number	Due Date	Description	Status
CA-076-01R	June 29, 2008	Map delineating buffer zones, homes, etc.	Complete
CA-076-02R	June 29, 2010	Conduct lagoon seepage test	Complete
CA-076-03R	August 31, 2006 for design  August 31, 2008 for completion of construction	Design and construction of facility improvements	<ul style="list-style-type: none"> <li>•Plans for Phase 1 submitted on February 6, 2012 and approved on March 13, 2012.</li> <li>•Plans for Phase 2 submitted on May 15, 2012.</li> <li>•Phase 1 construction begun on May 7, 2012.</li> </ul>
CA-076-04R	January 1, 2012	Permit renewal application	Complete

CA-076-01 Updated Plan of Operation. Since the facility is undergoing significant modifications to its infrastructure and because of additions to the sampling requirements made in this permit, the plan of operations, written in 2006, will have to be updated to reflect these changes. This plan should, in detail, describe the current operation, maintenance, and management of the wastewater treatment system.

CA-076-02 Ground Water Monitoring Network. The existing ground water monitoring network must be modified or extended so that potential ground water impacts from application to the 240 Acre Farm can be monitored. Sampling and testing is needed to determine the existing background levels of the sampling parameters. The land application management goal is that there are no detectable increases in wastewater related constituents in the ground water as determined by the monitoring program.

CA-076-03 Waste Solids Management Plan. Since the facility is expected to remove the bio-

solids that have built up in Lagoon No. 1 and possibly Lagoon No. 2, a waste solids management plan detailing how these solids will ultimately be disposed of should be drafted. DEQ requires that biosolids be applied in accordance with an approved Waste Solids Management Plan. If the facility intends to apply waste solids off site, this compliance activity would require submission of a plan to DEQ for review and approval before land applying waste solids. Prior to removing solids from a lagoon the facility should contact DEQ. After dredging solids from a lagoon, seepage testing of the lagoon(s) may be necessary before putting them back in service.

CA-076-04 Runoff Management Plan. Prior to applying recycled water a Runoff Management Plan with control structures and other BMPs shall be prepared and submitted to DEQ for approval. The plan shall address best management practices to prevent runoff from any site or fields used for wastewater reuse and for the minimization of ponding. The construction and implementation of BMPs shall be completed within three (3) months of plan approval.

CA-076-05 Lagoon Closure. Since Lagoon No. 3 has failed its seepage test, and is expected to be taken out of service instead of being repaired, it should be decommissioned in accordance with IDAPA 58.01.16.493.10.

CA-076-06 Site Closure. If the City has plans to relinquish ownership of the West Site, a closure plan must be completed and carried out before the transfer can take place according to IDAPA 58.01.17.801.02. A pre-closure meeting with DEQ should be arranged before the plan is prepared.

CA-076-07 Storage Lagoon. Since the new storage lagoon will be constructed on a former application site, solids from the site will need to be taken care of properly and meet all relevant regulations. Plans should be submitted to DEQ for approval before construction on the new lagoon has begun. Prior to the lagoon being put into service, a seepage test will need to be performed (see IDAPA 58.01.16.493.02.b).

CA-076-08 Permit Renewal. The City will need to submit an application to renew this permit 180 days before it expires in accordance with the Recycled Water Rules IDAPA 58.01.17.400.01.

## 6.2 Section F. Permit Limits and Conditions

Application Site Area has been modified to include the planned 240 Acre Farm acreage. The entire 240 acres will be permitted, but the current expectation is for wastewater to only be applied from the two center pivots. The total area of the 240 Acre Farm that can be irrigated by the center pivots is 108.4 acres, 70.7 for MU-076-03 and 37.7 for MU-076-04. As long as the City keeps possession of the West Site, MU-076-02, it will be included in the permit. Since a new storage lagoon is expected to be built on the South Site, MU-007601, its acreage will only be considered as part of the application site area until the new lagoon is constructed. The remaining 131.6 acres of the 240 Acre Farm will be permitted, though only approximately 40 acres will actually be available for effluent application after complying with Class D buffer zone setbacks.

Maximum Hydraulic Loading Rate, Non-Growing Season will be limited to emergency situations only. The permittee should contact DEQ if non-growing season application becomes necessary.

Fencing and Posting for a system applying Class D disinfection recycled water in rural areas and irrigating with sprinkler systems, should be protected by at least a three-wire pasture fence or equivalent, with signage posted every 500 feet along the fence and at the corners in English and Spanish that warns about the nature of the water on site.

Buffer Zone Distances will be those designated for a Class D system until the facility proves that it can consistently disinfect to a higher standard.

### 6.3 Section G. Monitoring Requirements

The following sampling requirements have been added to the Facility Monitoring Table:

- Hydraulic loading of supplemental irrigation water to be reported on a monthly basis.
- Quarterly ground water samples for the first two years of the permit to show the wells' background conditions. Static water levels in the ground water monitoring wells should be recorded every time samples are taken.
- Electrical Conductivity, Nitrate-N, Ammonia-N, pH, and Plant-available phosphorus should be tested semi-annually for the first two years of the permit to characterize the new soil composition on all permitted sites, but in subsequent years, samples are only required in April from soil monitoring units that are actively used for application. Nitrate and Ammonia soil concentrations are now required to be analyzed on an annual basis.
- Since supplemental irrigation water is anticipated to comprise a significant portion of the 240 Acre Farm's hydraulic loading, one grab sample analysis of supplemental water quality should also be completed annually for TKN, nitrate and nitrite, TDS, and total phosphorus.

### Appendix 1. Environmental Monitoring Serial Numbers

All environmental monitoring serial numbers have been changed from base 0079 in LA-000076-04 to base 076 in WRU M-076-04 to be consistent with recycled water permit conventions.

MU-076-03, MU-076-04, and MU-076-05 have been added as new hydraulic management units. MU-076-03 (East Pivot) is the area of the 240 Acre Farm irrigated by the eastern most pivot, described as existing pivot in the site plans. MU-076-04 is the area irrigated by the West Pivot, and is described as a combination of small pivots in the site plan. MU-076-05 is the remainder of the 240 Acre Farm not irrigated by the East and West Pivots and, includes the area set aside as buffer zones. The actual irrigated area on MU-076-05 and the volume and type of water (supplemental and/or recycled ) shall be clearly noted in the annual reports.

WW-076-01, the irrigation and reuse pump station sample tap will be designated as the only wastewater sampling point. IW-076-01, also located at the irrigation and reuse pump station, will be the only irrigation water sampling point. Even though the large pivot receives irrigation water from a different pump station, it is assumed that the supplemental irrigation water quality from the other pump stations is similar and the requirement to sample at only one location is sufficient.

SU-076-01, SU-076-02, SU-076-03, SU-076-04, and SU-076-05 are the soil monitoring units corresponding to the above HMUs.

LG-076-06 is the serial number for future storage lagoon that will be built on the current South Site (MU-076-01) after recycled water irrigation starts to the new 240 Acre Farm

### Appendix 2. Site Maps

This section includes a site view, a regional view, and a satellite view of the current reuse system to which was added the new 240 Acre Farm and the future storage lagoon.

## 7. RECOMMENDATIONS

Based on review of applicable state rules, staff recommends that DEQ issue draft Reuse Permit WRU-0076-04 for a public review and comment period. The draft permit contains effluent quality requirements for the recycled water treatment system, as well as terms and conditions required for operation of the reuse system in Section F. Monitoring and reporting requirements to evaluate system performance and to determine permit compliance have been specified in Sections G and H, and compliance activities have been incorporated into Section E of the permit.

## 8. REFERENCES

Idaho Department of Environmental Quality (DEQ). 2007. Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater.

J•U•B ENGINEERS, Inc. (JUB). 2012. City of Wendell: Recycled Water Permit Technical Report.

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TRIM Record 2012AGH619

TRIM Record for Permit 2012AGH845