INEL-96/0246

July 1996

RECEIVED
AUG 22 1996

OSTI

Radioactive Liquid Waste Generation Goals at the ICPP

J. L. Tripp

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

RB

Lockheed
Idaho Technologies Company

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Radioactive Liquid Waste Generation Goals at the ICPP

J. L. Tripp

Published July 1996

**Idaho National Engineering Laboratory
High Level Waste Program Department
Lockheed Martin Idaho Technologies Company
Idaho Falls, Idaho 83415**

**Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operation Office
Contract DE-AC07-94ID13223**

CONTENTS

BACKGROUND	1
CURRENT ACTIVITIES	1
REFERENCES	9
Appendix A - Waste Stream Goals	A-1
Appendix B - Modeling Results	B-1

FIGURES

1. Changes in waste generation estimates for the period 1996-2012	6
2. Graph 1: Improvement options for NWCF through 2012	7
3. Waste generation program logic diagram	8

TABLES

1. Waste generation goals	2
---------------------------------	---

DISCLAIMER

**Portions of this document may be illegible
in electronic image products. Images are
produced from the best available original
document.**

Radioactive Liquid Waste Generation Goals at the ICPP

BACKGROUND

Processes operating at the ICPP generate hazardous radioactive liquid waste which is sent to the tank farm. These processes include NWCF, PEW evaporator, LET&D, tank farm, and fuel storage operations as well as others. The recently signed Batt Settlement Agreement between the DOE, Navy and State of Idaho indicates that all waste in the tank farm must be calcined by the end of 2012. Therefore, each gallon added to the tank farm is one more gallon which must be calcined prior to the 2012 date. Past projections of the future waste generation showed an extensive effort on waste reduction is required, as well as improved calcining rates, to reach the 2012 goal.

Baseline waste generation goals were first established in Appendix B of the ICPP Tank Farm Systems Analysis report in January of 1994.¹ These estimates projected waste generation based on the best knowledge available at that time. These projections with a few adjustments have been used in the modeling conducted to date.

In May of 1994, the INEL Radioactive Liquid Waste Management Plan was issued.² This report proposed an integrated plan to manage generation of radioactive liquid waste at the INEL based on a budgeting type approach. This report also recommended waste minimization goals established as annual targets or ceiling limits and incorporated into CPAF, Progress Tracking, or Total Quality processes including non-financial objectives and company performance indicators. Approval for all waste generation and additional approvals for waste generation over the fiscal year's goal was needed. This plan was never implemented.

CURRENT ACTIVITIES

The waste generation goals have been reviewed and updated and are shown in Table 1. Appendix A gives more details on these waste streams. The new goals were based on historical information taken from the monthly tank farm report, on previously forecast numbers, on projected projects and operations, on waste streams currently approved and on consultations with the subject matter experts in the various waste generation areas. A facilitated meeting was held to determine the new waste generation goals and best approach to reaching them.³ The participants in this meeting included operations, environmental, engineering and technology development personnel.

Waste streams were individually analyzed in this meeting and several adjustments made. Further adjustments were made after the meeting to reduce the risks associated with meeting the goals. Some of these risks include operation of the evaporators. It was indicated the evaporators will be operated more conservatively in the future because of a lack of money to replace parts and conduct repairs. Therefore, the reduction ratios on the waste streams were reduced to reflect this problem. It was also noted there are some operating limits on the PEW and HLLWE which effect the efficiency of the operation (7000 gal/day of feed to the PEW based on the RCRA permit).

Table 1. Waste generation goals.

Waste Stream	Volume Generation and Evap. Reduction	Comments and Concerns
1 - NWCF Bed Dissolutions	25,000 gallons/dissolution. 3 dissolutions/run. Direct to Tank Farm then 2:1 HLLW reduction.	Assume 1000 gallons of bed dissolved, which at a 7:1 ratio is equivalent to 7000 gallons of blended feed. Therefore 56% of the 12,500 evaporated gallons is blended feed and no additional ANN is needed to calcine.
2 - NWCF Operations	3000 gallons/month while operating NWCF. No evaporator reduction.	Includes deep recycle of scrub, absorber washer, etc. Assume 50% is equivalent to blended feed so no additional ANN is needed to calcine.
3 - NWCF Turnaround	70,000 gallons of decon solutions for a 12 month turnaround. 180,000 gallons of decon solutions for a 3 or 4 year turnaround. 40% of each direct to Tank Farm then 2:1 HLLWE reduction. 60% of each of PEW for 20:1 reduction then 2:1 HLLWE reduction.	Assumes no major vessel replacements. Consists of nitric acid, dissolved calcine, water, and various decon chemicals.
4 - PEWE Direct to Tank Farm	3000 gallons/year. 2:1 HLLWE reduction.	This is acid or other solutions with high chloride, organics, or other components not allowed in the PEW.
5 - 603 Removal	1.5 million gallons of water. 50,000 gallons/month starting in FY-99 until all processed. 30:1 PEW reduction then 2:1 HLLWE reduction.	May be able to achieve higher PEW reduction without RCRA permit limit of 7000 gal feed/day and with adequate spare parts for PEW maintenance. (Same in all "water evap" cases.)
6 - ROVER Deactivation - (CPP-640)	10,000 gallons/yr for FY-98, -99, and -00. 20:1 PEW reduction then 2:1 HLLWE reduction.	Consists of water, nitric acid and decon solutions.
7 - CPP-601 Decontamination	3000 gallons in FY-96 for embedded line project. 20:1 PEW reduction then 2:1 HLLWE reduction.	Consists of water, nitric acid and decon solutions. No further work in CPP-601 is planned.
8 - Filter Leach	115 filters/yr processed with three 60 gal 3M acid washes and two 60 gal water rinses per batch. 10:1 PEW reduction then 2:1 HLLWE reduction. Currently have 256 filters in NWCF storage, 147 in FDP (6 filters/batch), and 34 in RWMC.	115 filters/yr is maximum allowed in Part B permit. There is a possibility this could be higher if non-ICPP filters are processed. This waste stream is currently mixed with other waste from NWCF decontamination area.
9 - Tank Farm Sumps to Tank Farm	100 gallons/year. No further reduction.	
10 - LET&D to Tank Farm	3500 gallons of 13M nitric acid in FY-96. No further reduction.	Assumes acid recycle tank will be in service starting FY-97. Then all acid will be reused in processing or decontamination operations.

Table 1. (Continued)

Waste Stream	Volume Generation and Evap. Reduction	Comments and Concerns
11 - Tank Farm Line Flushes	1000 gal/yr to tank farm. No further reduction.	This covers possible upgrades to 6 valve boxes and other maintenance work.
12 - FSA Deactivation	3.2 million gallons of water starting in FY-2008. 50,000 gallons/mo to PEW. 30:1 PEW reduction then 2:1 HLLWE reduction.	This is a new waste stream anticipated in this time frame.
13 - PEW Bottoms		
A. NWCF Operations	2500 gallons/mo during NWCF operations. 20:1 PEW reduction then 2:1 HLLWE reduction.	Floor drains, etc. This waste stream during non-operating periods is covered under NWCF turnaround waste streams.
B. FAST FSA	25,000 gal/yr until deactivation in 2008. 30:1 PEW reduction then 2:1 HLLWE reduction.	From filter backwashes, cask washdown, etc.
C. FAST FDP	3000 gal/yr. 30:1 PEW reduction then 2:1 HLLWE reduction.	From safety shower testing, mop downs, etc.
D. Cell Floor Drains	36,000 gal/yr. 20:1 PEW reduction then 2:1 HLLWE reduction.	This is CPP-601 deep tanks, mostly analytical waste, therefore could be high chloride.
E. WCF Sumps	4000 gal/yr for FY-96 thru FY-98. 30:1 PEW reduction then 2:1 HLLWE reduction.	Water from runoff and condensate.
F. NWCF Decon Room	30,000 gal/yr for non-campaign years. 20,000 gal/yr for campaign years. 20:1 PEW reduction then 2:1 HLLWE reduction.	Excludes filter leach but include debris treatment on non-campaign years. Stream consists mostly of nitric acid, water and decon solutions.
G. LET&D	2000 gal/yr. 10:1 PEW reduction then 2:1 HLLWE reduction.	Dilute nitric acid from upset conditions.
H. CPP-603 - Wet Side	20,000 gal/yr in FY-96 through FY-98 then 1000 gal/yr. 30:1 PEW reduction then 2:1 HLLWE reduction.	Water from filter backwash, washdowns, etc.
I. CPP-603 - Dry Side	5000 gal/yr. 30:1 PEW reduction then 2:1 HLLWE reduction.	Water from washdowns, safety showers, etc.
J. Tank Farm Sumps	60,000 gal/yr. 30:1 PEW reduction then 2:1 HLLWE reduction.	Water from storm runoff.
K. Pilot Plants	1000 gal/yr. 10:1 PEW reduction then 2:1 HLLWE reduction.	From WL-104/105, expected to be acidic.

Table 1. (Continued)

Waste Stream	Volume Generation and Evap. Reduction	Comments and Concerns
L. RCRA Wells	5000 gal/yr. 30:1 PEW reduction then 2:1 HLLWE reduction.	Water from sampling RCRA wells.
M. Misc. Balance of Plant	30,000 gal/yr. 30:1 PEW reduction then 2:1 HLLWE reduction.	Includes jet dilution, PWL sumps, etc.
N. PEW Descale	2000 gal/yr. 2:1 HLLWE reduction.	No PEW reduction as this is descaling chemical and rinses added directly to PEW during maintenance.
O. Other INEL	60,000 gal/yr. 30:1 PEW reduction then 2:1 HLLWE reduction.	TRA - 50,000 gal/yr water. TAN - possible 9600 gal mixed waste total.
14 - D&D/Deactivation Activities		There are several D&D activities included in the EIS, ROD, or STP which have not been addressed in the above waste streams. They are included here although amounts generated are highly subject to change.
A. WCF (CPP-633)	0	Current plans to grout this facility in place in FY-98-99. Indications are that the state will accept this approach on this facility.
B. CPP-603 Fuel Storage	50,000 gal total in FY-99 thru FY-00. 10:1 PEW reduction then 2:1 HLLWE reduction.	This may go to zero if it is decided to grout this facility in place with the same approach as the WCF facility.
C. Fuel Processing Complex (CPP-601)	0	No plans currently for this facility although it is included in the EIS and ROD as a D&D activity that is planned.
D. Tank Farm Heel Removal	0	This EIS and ROD indicates the liquid and solid heels from the 11 tanks will be removed (assumed starting around 2009). However, current plans are to leave heels in place and complete a RCRA closure.
E. FDP (CPP-666)	0	No plans currently for this facility.
15 - Discretionary	12,000 gal/yr. 2:1 HLLWE Reduction.	This is to cover unplanned maintenance, exceptionally wet weather, etc.

Also on the D&D projects, the current approach is to grout everything in place. This approach is expected to be approved for the WCF facility; however, it is unsure if it will be allowed for the CPP-603 basin and other areas.

This information was adjusted and modeling completed to determine the waste reduction achieved (Appendix B contains the detailed spreadsheets). The results of this update indicate that there has been a significant reduction in the waste generation goals from two years ago. If the updated baseline goals are met,

a 35% waste reduction will be achieved. Figure 1 compare the original estimates and the current estimates. This waste reduction, coupled with an increase in the calcination rate, will enable the achievement of the goal to process the waste in the tank farm by 2012 (Figure 2). However, this does not mean that waste generation is no longer a problem. There must be a program in place to ensure these waste goals are met.

The team in the facilitated meeting felt an approach to ensure these goals are met as severe as that detailed in WINCO-1212 was not justified. This team recommend a "monitoring" program versus a "regulatory" program. Past recommendations suggested that each generator be approved for only a certain volume of waste per fiscal year and if they generated more they must get approval from a "regulatory" group. This will simply add to the already overwhelming regulation and needed approvals imposed on Operations and will be counterproductive. At this time, a monitoring and reporting function in conjunction with company level incentives will ensure these waste generation goals are met. This will provide the tool that responsible management personnel need to make decisions on the waste generating activities. Figure 3 is a logic diagram of this monitoring program.

The waste generation goals will be reviewed annually to ensure they reflect all of the current planning. The actual waste generation is monitored by an Integrated Product Team (IPT) consisting of waste generators from various plant areas and other essential personnel. The team contains representatives from NWCF, Tank Farm, CPP-603, FDP/FSA, CPP-601, PEW/LET&D, and NWCF Decontamination Area as well as a representative from Engineering Support, Facility Deactivation and the Waste Management Authority. A representative from the Technology Development area is the coordinator of this team. The team meets quarterly and each representative reports the waste generation which occurred during the past quarter. These figures are discussed and compared to the baseline. Any significant deviations from the baseline are explained and justified. Once a year the baseline goals are reviewed and revised to reflect current and future plans for the various areas. This approach will aid in making the waste generators aware of the impact of the waste they are generating and help them to see the importance of reducing the waste generated.

Every six months the IPT coordinator provides a written report to LMITCO management detailing the status of the waste generation versus the goals. It will point out any significant deviations or problem areas. This report will make the waste generation goals more visible to each generator and to management. The responsible management personnel will also have the tools needed to impose stricter controls if the situation warrants them.

In addition, a company/DOE level incentive will be established on reaching the waste generation goals. This will help to keep waste generation an important issue when management is deciding the tradeoffs between items such as schedules, costs, and radiation exposures. There is currently no penalty for generating excessive waste. A company level incentive would result in most department managers setting up their own incentives and emphasize the importance of not generating excessive waste.

Figure 1. Changes in Waste Generation Estimates for the Period 1996-2012

Figure 2. GRAPH I: IMPROVEMENT OPTIONS FOR NWCF THROUGH 2012
(Version 2)

Figure 3. Waste generation program logic diagram.

This portion of the HLW program will track waste being generated and compare these amounts to established goals to ensure meeting the 2012 date for removal of waste from the tank farm. The baseline waste generation goals will be revised yearly to capture the changing plans to schedules.

REFERENCES

1. Palmer, W. B. et al, "ICPP Tank Farm Systems Analysis," WINCO-1192, Appendix B, January 1994.
2. Collins, J. W. et. al., "INEL Radioactive Liquid Waste Management Plan," WINCO-1212, May 1994.
3. Seward, Linda, letter to Julia L. Tripp, LCS-07-96, Waste Generation Meeting Summary Report, dated April 1, 1996

Appendix A

Waste Stream Goals

Waste Stream #1 - NWCF Bed Dissolutions

Use 25,000 gallons per bed dissolution with 3 dissolutions per 18 month NWCF campaign. Due to the uncertainties with the agglomeration potential of the bed in the new flowsheets, this waste stream was not reduced to two dissolutions per run. These dissolutions are done with 6 M nitric acid; however, since it is dissolved calcine, this solution will be sent directly to the Tank Farm, bypassing the PEW. A reduction of 2:1 in the HLLWE was anticipated. When calculating the amount of calcine generated from this waste, the fact that it is essentially dilute blended feed should be considered. If a 1000 gallon bed is assumed (a full bed is around 5000 gallons but usually most of this is transferred out as calcine solids), this is equivalent to about 7000 gallons of blended feed (using a 7:1 volume reduction in the calciner). Therefore, 56% $[(7000)/(25,000/2)]$ of this waste stream is actually blended feed and no additional ANN is required for this portion.

The Palmer report used the same assumptions for this waste stream but did not mention the fact it was partially blended feed and therefore the additional ANN requirement is reduced.

Waste Stream #2 - NWCF Operations

Use 3000 gallons/month during NWCF campaigns. Assume no evaporator reduction since the nitric acid, fluoride, chloride, radioactivity and possibly mercury concentrations will not allow it to be sent to the PEWE or HLLWE. This waste stream includes the deep recycle of the scrub solution (1500 gallons each time), the absorber washes, and other sources like leak collection. A portion of this is equivalent to blended feed as it is essentially redissolved calcine. Assume 50% is equivalent to blended feed so no additional ANN is needed to calcine. This is historically a little high, however, it is possible the future flowsheets may cause more Cl and fines carryover which would increase this number.

The Palmer report used the same assumptions for this waste stream but did not consider that part of the stream was essentially blended feed and therefore the additional ANN requirement is reduced.

Waste Stream #3 - NWCF Turnaround

Use 70,000 gallons of decon solution for a 12 month turnaround and 180,000 gallons for a 3-4 year turnaround. Approximately 40% of each of these stream would be routed direct to the tank farm with a subsequent HLLWE reduction of 2:1 because of the concentrations and radioactivity. The other 60% would be routed to the PEW for a 20:1 reduction with a subsequent HLLWE reduction of 2:1. These turnaround volumes assume no major vessel replacements. The 3-4 year turnaround would consist mainly of the off-gas and calciner cell decontaminations. This solution consists of nitric acid, dissolved calcine, water and various decon chemicals. This results in a total dilute volume of 570,000 gallons generated through 2012 or 122,550 gallons of evaporated volume.

The Palmer report assumed a total of 256,300 gallons of evaporated volume in the same time period.

Lower expected future activities is one of the reasons this number is less than previously expected. Highly dependent on schedule (if in a rush more chemical is generally generated). In the past campaign turnaround did very well in the calciner cell and off-gas cell but generated a lot in the filter banks because of inability to reach a plugged line any other way. More extensive decons may be used in the future to reduce radiation exposure and allow longer stay times in the cell. This is a tradeoff which will have to be evaluated.

Waste Stream #4 - PEWE Direct to the Tank Farm

Use 3000 gallons/year with a 2:1 HLLWE reduction. This is acid or other solutions with high chloride, organics, or other components not allowed in the PEW. This waste stream comes from the CPP-601 deep tanks (from analytical laboratories), CPP-641 west side tanks (from pilot plants), tank trucks and the fuel storage basins. This waste normally sent to the PEW, which for some reason (like high uranium, radioactivity, nitric acid, fluoride, chloride, or sulfate) cannot be processed in the PEW. This generates a total evaporated waste volume through 2012 of 25,500 gallons. The Palmer report assumed an evaporated volume during this same time period of 103,700 gallons.

In FY-92 and 93 this number was around 1000 gal/yr and in FY-94 and -95 it was around 3500 gal/yr partly because of 2nd and 3rd cycle rinses. Since activity in general is decreasing, the amount going direct to the tank farm should be lower.

Waste Stream #5 - 603 Removal

This waste stream is the water to be removed from the 603 basins after all of the fuel has been moved. These pools contain about 1.5 million gallons. Assume 50,000 gallons will be processed per month through the PEW at a reduction factor of 30:1 starting in FY-99 until all is processed. This will undergo a further reduction of 2:1 in the HLLWE. This assumes no flushes or sludge removal. Although this is deionized water it is quite dirty with desert dust and sludge and also contains about 50 ppm Cl. To get a higher PEW reduction, LET&D operation must be optimized (may require additional condensate tanks). A total of 25,000 gallons goes to the tank farm after evaporation. The normal flushes of the ion exchange units up until this time are covered under the PEW Bottoms waste stream.

The Palmer report estimated 20,000 gallons after evaporation. The current estimate is slightly higher because of budget constraints on obtaining spare parts for the evaporators which requires that they be operated more conservatively to ensure corrosion is controlled to a minimum.

Operations may be able to achieve a higher PEW reduction if the RCRA permit limit of 7000 gal feed/day is eliminated and if adequate spare parts are provided for PEW maintenance.

Waste Stream #6 - ROVER Deactivation (CPP-640)

Assume 10,000 gallons/yr for FY-98, -99 and -00. This is water, nitric acid and decon solutions used to wash down the outside of equipment. Therefore, use a 20:1 PEW reduction factor and a 2:1 HLLWE reduction factor. This results in 750 gallons to the tank farm after evaporation. The Palmer report estimated 500 gallons to the tank farm after evaporation.

Uranium removal is currently taking place in the dry side. In FY-98, decon of the dry side including removal of all equipment will start. Plans may involve immobilizing contamination inside of pipes with a foam material then cutting out the pipes.

Waste Stream #7 - CPP-601 Decontamination

Use 3000 gallons in FY-96 for the embedded line project. This will be water, nitric acid and decon solutions therefore use a 20:1 PEW reduction factor and a 2:1 HLLWE factor. No further work in CPP-601 is planned and all other waste streams from this building are included in the PEW bottoms number. This results in 75 gallons to the tank farm after evaporation compared to 1152 gallons from the Palmer report.

Waste Stream #8 - Filter Leach

The maximum number of filters that can be processed in a year are 115 according to the Site Treatment Plan. Use this number, although less could be processed (more like 80/yr), since the final resulting volume will be the same. Each filter requires three 60 gallon 3M nitric acid flushes followed by two 60 gallon water flushes. All of this solution from the test filters (which were supposed to be some of the worst filters) was sent to the PEW (mixed with other wastes coming out of the decon shop). Use a 10:1 reduction factor in the PEW and another 2:1 in the HLLWE. There are currently 256 filters in storage at the NWCF, 147 in FDP (which are processed 6 filters per batch as these are small filters) and 34 at RWMC. There is a chance that filters from other facilities will be processed but that is not included in this amount. Assume additional filters are being generated at a rate of 2 filters every 10 days of NWCF operation (with no filters being generated during shutdown periods), 1 filter per year from the VOG, 5 filters per year from the Process Atmospheric Protection System (PAPS), 8 filters per year from LET&D and 104 filters in the Ventilation Atmospheric Protection System in FY-98. The WCF filters (10 large filters) will be grouted in place.

This results in an evaporated tank farm volume of 17,970 gallons compared to the Palmer estimate of 49,415 gallons (difference primarily because of possible evaporation).

Waste Stream #9 - Tank Farm Sumps to Tank Farm

Use 100 gallons/yr with no further reduction. Most of the sump water is sent to the PEW, however, this is the amount that cannot be sent to the PEW because of the piping arrangement or high activity in the water from valve leaks. The Palmer report also used 100 gal/yr.

Waste Stream #10 - LET&D to Tank Farm

This stream is the concentrated bottoms from the LET&D process. Currently the acid recycle tank is not in service because of some procedural changes and other items which must be addressed to obtain DOE approval. It is anticipated this will be in service by the first of FY-97. After this date, all concentrated acid from these bottoms will be used in processing or decontamination operations. For FY-96, this stream is 3500 gallons of 13 M nitric acid with no further evaporator reduction due to the high molarity. This number is based on historical numbers (FY-93 - 5600 gal, FY-94 - 6750 gal, FY-95 - 3400 gal). The acid recycle tank is 20,000 gallons, therefore, even for a four year shut down there should be sufficient storage space for all of this nitric acid.

The Palmer report estimated a higher generation rate (15,000 gallons/yr vs 3500 gal/yr) than current operations indicates. Therefore, the total volume of this waste stream to the tank farm was around 137,500 gallons in past reports.

Waste Stream #11 - Tank Farm Line Flushes

Assume 1000 gal/yr to the tank farm with no further reduction. This covers upgrades to six valve boxes and other maintenance work. Some years this is higher and others will be at zero, therefore this should be a good average.

The Palmer report uses 500 gallons/yr.

Waste Stream #12 - FSA Deactivation

Current plans indicate that the fuel will be moved out of the Fuel Storage Area (FSA) in FAST by FY-2008. The Navy is building their own dry storage. This will then require the processing of the water in these 6 pools. The pools hold approximately 3.2 million gallons of water. Assume this is processed 50,000 gallons/month through the PEW until gone at a 30:1 PEW reduction then a 2:1 HLLWE reduction. A high reduction may be achieved, but because of current practice of mixing with other wastes and the fact there is not money for evaporator repairs necessitating a very conservative operation this reduction was estimated fairly low in this case.

This stream was not addressed in the Palmer report.

Waste Stream #13 - PEW Bottoms

The Palmer report addressed this as one waste stream generating 25,000 gallons/yr. Later in modeling this was changed to 10,000 gallons/yr. Historically this amount has ranged from FY-92 - 11250 gal, FY-93 - 12750 gal, FY-94 - 21400 gal, FY-95 - 10750 gal.

Because the idea is to track the generation of these wastes this report broke the streams down into individual waste streams. These streams are detailed below:

A - NWCF Operations

This is estimated to be 2500 gal/mo during NWCF operations from floor drains, etc. and is covered under the NWCF turnaround waste stream (# 3) during non operating periods. This waste can be reduced 20:1 in the PEW then 2:1 in the HLLWE. During operations this is frequently recycled to the calciner feed batches. This consists of water and decon solutions. (NCC-122).

B - FAST FSA

Assume 25,000 gal/yr until deactivation in 2008. This is water from filter backwashes and cask washes. This can be reduced in the PEW at 30:1 then 2:1 in the HLLWE. This is based on one backwash per month at 1000 gallons each plus 12,000 gallons/yr for cask and rack washdowns and sumps.

C - FAST FDP

Assume 3000 gal/yr of mostly water from safety shower checks and periodic mop downs. This can be reduced in the PEW at 30:1 then 2:1 in the HLLWE.

D - Cell Floor Drains

Assume 36,000 gal/yr from the CPP-601 deep tanks. This is mostly analytical waste and therefore could be high chloride. All RCRA flushes of CPP-601 are complete. Some additional waste is expected to be generated from the sumps (1000 gal/yr). Past history, from FY-92 to FY-93, shows higher numbers because of 2nd and 3rd cycle operations and subsequent flushes. In the Collins report, this waste stream volume was 75,000 gal/yr. Assume a 20:1 PEW reduction then a 2:1 HLLWE reduction.

E - WCF Sumps

Assume 4000 gal/yr for FY-96 through FY-98. This is water from runoff and steam condensate. Historical values put this around 6000-9000 gal/yr but some work has been completed by berming areas to reduce the amount collected from runoffs. After FY-98, it is anticipated this structure will undergo RCRA closure. The current plan is to grout the building in place.

F - NWCF Decon Room

Assume 30,000 gal/yr in non-campaign years for debris treatment and other decontamination activities (excludes filter leach). Assume 20,000 gal/yr for campaign years (excludes filter leach). This is nitric acid, water and decontamination solutions and can be reduced in the PEW at 20:1 then in the HLLWE at 2:1.

G - LET&D

Assume 2000 gal/yr at a 10:1 PEW reduction and a 2:1 HLLWE reduction. This stream covers the dilute nitric acid which would be routed to the PEW under upset conditions in the LET&D.

H - CPP-603 - Wet Side

Assume 20,000 gal/yr in FY-96 through FY-98 will be generated from filter backwashes and other operations. After this the water will be removed from the pools as the facility undergoes a closure. Assume 1000 gal/yr after this because of a few systems expected to remain for liquid collection. This has a 30:1 PEW reduction and then a 2:1 HLLWE reduction.

I - CPP-603 Dry Side

Assume 5000 gal/yr for water from washdown, safety showers, etc. This should have a 30:1 PEW reduction then a 2:1 HLLWE reduction.

J - Tank Farm Sumps

Assume 60,000 gal/yr of water from storm runoff. Some years this is 80,000 gal and others much lower; completely weather dependent. Assume a 30:1 PEW reduction then a 2:1 HLLWE reduction.

K - Pilot Plants

Assume 1000 gal/yr from WL 104/105. This could be a variety of probably acidic solutions. Assume a 10:1 PEW reduction then a 2:1 HLLWE reduction.

L - RCRA Wells

Assume 5000 gal/yr from water sampling activities on RCRA wells. This will have a 30:1 reduction in the PEW then a 2:1 reduction in the HLLWE.

M - Misc. Balance of Plant

Assume 30,000 gal/yr covers jet dilution, PWL sumps and other plant sources. This will have a 30:1 PEW reduction then a 2:1 HLLWE reduction.

N - PEW Descale

Assume 2000 gal/yr with a 2:1 HLLWE reduction. This is chemical added to the PEW to remove scale (and therefore ends up in the bottoms) The chemicals used are generally high sodium chemicals such as TURCO 4502.

O - Other INEL

The ICPP may still receive liquid waste from other INEL sites. These include TRA (50,000 gal/yr), and 9600 gallons from TAN. Include 60,000 gal/yr in this waste stream to cover the possibilities. This should have a 30:1 PEW reduction then a 2:1 HLLWE reduction.

14 - D&D/Deactivation Activities

NOTE: There are several D&D activities included in the EIS, ROD or STP which have not been addressed in the above waste streams. These are included here although amounts generated are highly subject to change.

A - WCF (CPP-633)

Current plans are to grout this facility in place in FY-98 and -99. Current indications are that the state will accept this approach on this facility.

B - CPP-603 Fuel Storage

Assume 50,000 gal total in FY-99 thru FY-00 to remove sludge and decon activities. This will have a 10:1 PEW reduction then a 2:1 HLLWE reduction. This may go to zero if it is decided to grout this facility in place with the same approach as the WCF facility.

C - Fuel Processing Complex (CPP-601)

There are no current plans for this facility although it is included in the EIS and the ROD as a D&D activity that is planned.

D - Tank Farm Heel Removal

The EIS and ROD indicates the liquid and solid heels from the 11 tanks will be removed (assumed starting around 2009). However, current plans are to leave heels in place and complete a RCRA closure.

E - FDP (CPP-666)

No current plans to deactivate this facility.

15 - Discretionary

Include a discretionary volume of 12,000 gal/yr (with a 2:1 HLLWE reduction) to cover unplanned maintenance, exceptionally wet weather, etc.

Appendix B

Modeling Results

Dilute Waste Generation

CBM\TRIPPGE6.XLS Page 1 of 12

Goal Scenario. Incorporating J.L. Tripp Data for 3/27/96.

Waste number 0= minimal feed adjustment required; 1= sodium (Na) waste type; 2= non-sodium-acid-decon(H+) waste type.

Units in Gallons		Fiscal Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Waste		PEW	HLLWE	0	11	7	5	12	1				6
JLT#	Stream	Waste Number	Owner	Factor	Factor	Months of Calcination	Rate						
1	NWCF Bed D	0	Oswald	1	2	44% ANN	25,000		50,000	25,000			25,000
2	NWCF Ops	0	Oswald	1	1	50% ANN Required		0	33,000	21,000	15,000	36,000	3,000
3	NWCF Turn	2	Oswald	1	2					28,000			72,000
3	NWCF Turn	1	Oswald	20	2					42,000			108,000
4	PEW Direct	2	Oswald	1	2			3,000	3,000	3,000	3,000	3,000	3,000
5	603 removal	1	Kaylor	30	2				600,000	600,000	300,000		
6	640 Decon RO	1	Oswald	20	2				10,000	10,000	10,000		
7	Decon 601	1	Oswald	20	2		3,000						
8	Filter Leach	1	Oswald	10	2	300	0	34,500	34,500	34,500	34,500	34,500	17,400
9	T.F. Sumps	1	Oswald	1	1		100	100	100	100	100	100	100
10	LET&D	2	Oswald	1	1		3,500						
11	T.F. Lines	1	Oswald	1	1		1,000	1,000	1,000	1,000	1,000	1,000	1,000
12	666 FSA deact	2	Kaylor	30	2								
13	PEW Bottoms	1	Oswald	1	1								
13 a	NWCF Op	Oswald	20	2			0	27,500	17,500	12,500	30,000	2,500	0
13 b	FAST FSA	Kaylor	30	2			25,000	25,000	25,000	25,000	25,000	25,000	25,000
14 c	FAST FDP	Kaylor	30	2			3,000	3,000	3,000	3,000	3,000	3,000	3,000
13 d	Cell Floor	Oswald	20	2			36,000	36,000	36,000	36,000	36,000	36,000	36,000
13 e	WCF Sum	Oswald	30	2			4,000	4,000	4,000				
13 f	NWCF De	Oswald	20	2			30,000	20,000	20,000	20,000	20,000	30,000	20,000
13 g	LET&D	Oswald	10	2			2,000	2,000	2,000	2,000	2,000	2,000	2,000
13 h	603 Wet si	Kaylor	30	2			20,000	20,000	20,000	1,000	1,000	1,000	1,000
13 i	603 Dry si	Kaylor	30	2			5,000	5,000	5,000	5,000	5,000	5,000	5,000
13 j	Tank Farm	Oswald	30	2			60,000	60,000	60,000	60,000	60,000	60,000	60,000
13 k	Pilot Plant	Valentine	10	2			1,000	1,000	1,000	1,000	1,000	1,000	1,000
13 l	RCRA Wel	Oswald	30	2			5,000	5,000	5,000	5,000	5,000	5,000	5,000
13 m	Misc Bal o	Oswald	30	2			30,000	30,000	30,000	30,000	30,000	30,000	30,000
13 n	PEW Desc	Oswald	1	2			2,000	2,000	2,000	2,000	2,000	2,000	2,000
13 o	Other INE	Oswald	30	2			60,000	60,000	60,000	60,000	60,000	60,000	60,000
14	D&D/Deactivation Activiti	Oswald	1	1									
14 a	WCF	Oswald	1	1			0	0	0	0	0	0	0
14 b	603 fuel st	Kaylor	10	2			0	0	15,000	15,000	20,000	0	0
14 c	CPP-601	Oswald	1	1			0	0	0	0	0	0	0
14 d	TF Heelou	Oswald	1	1			0	0	0	0	0	0	0
14 e	FDP	Oswald	1	1			0	0	0	0	0	0	0
15	Discretionary	None	1	2	Contingenc	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765
Filters Generated							14	80	160	44	86	20	14
Filters To Work Off						316	330	295	340	269	240	145	44
Filters Worked off							0	115	115	115	115	115	58
Total, gallons							305,365	433,865	481,865	952,865	1,046,365	820,865	310,365
Cumulative Total, gallons							305,365	739,229	1,221,094	2,173,959	3,220,324	4,041,188	4,351,553
Portion from NWCF ops							0	102,800	128,600	24,000	107,600	209,800	0
Cumulative							0	102,800	231,400	255,400	363,000	572,800	572,800
Per Campaign(w/filter leach)						avg=	275,400		231,400		341,400		
D&D portion (tot less NWCF)							305,365	331,065	353,265	928,865	938,765	611,065	310,365
Cumulative							305,365	636,429	989,694	1,918,559	2,857,324	3,468,388	3,778,753
Volume to PEW annually							284,000	554,000	628,500	1,148,500	1,143,000	921,000	493,000
Number of 7000 gallon batches							41	79	90	164	163	132	70

Appendix B
B-1

Dilute Waste Generation

Waste number	Units in Gallon	Waste	12	6	6	12	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	Thru 2012	2013 thru 2035	23 yrs	
1 NWCF Bed D	50,000	50,000	25,000	25,000	18,000	36,000	0	0	36,000	18,000	18,000	36,000	36,000	0	0	3,000	3,000	375,000	375,000	375,000	90	
2 NWCF Ops	36,000	36,000	0	0	0	0	0	0	36,000	18,000	18,000	36,000	36,000	0	0	0	0	270,000	270,000	270,000	90	
3 NWCF Turn	28,000	28,000	0	0	0	0	0	0	28,000	14,000	14,000	28,000	28,000	0	0	0	0	228,000	228,000	228,000	90	
3 NWCF Turn	42,000	42,000	0	0	0	0	0	0	42,000	21,000	21,000	42,000	42,000	0	0	0	0	342,000	342,000	342,000	90	
4 PEW Direct	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	1,500,000	1,500,000	1,500,000	90	
5 603 removal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	63,000	63,000	63,000	90	
6 640 Deccon RO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30,000	30,000	30,000	90	
7 Deccon 601	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,000	3,000	3,000	90	
8 Filter Leach	25,800	25,800	15,000	15,000	15,000	25,800	4,200	4,200	15,000	15,000	15,000	25,800	4,200	4,200	4,200	4,200	4,200	376,200	376,200	376,200	90	
9 T.F. Sumps	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	2,100	2,100	2,100	90	
10 LEI&D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,500	3,500	3,500	90	
11 T.F. Lines	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	21,000	21,000	21,000	90	
12 666 FSA deact	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,000,000	3,000,000	3,000,000	90	
13 PEW Bottoms	30,000	30,000	0	15,000	15,000	30,000	0	0	30,000	15,000	15,000	30,000	30,000	0	0	0	0	225,000	225,000	225,000	90	
13 b	25,000	25,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	63,000	63,000	63,000	90	
13 d	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	756,000	756,000	756,000	90	
13 e	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	530,000	530,000	530,000	90	
13 f	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	42,000	42,000	42,000	90	
13 g	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	78,000	78,000	78,000	90	
13 h	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	105,000	105,000	105,000	90	
13 i	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	1,260,000	1,260,000	1,260,000	90	
13 j	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	21,000	21,000	21,000	90	
13 k	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	105,000	105,000	105,000	90	
13 l	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	630,000	630,000	630,000	90	
13 m	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	42,000	42,000	42,000	90	
13 n	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	1,260,000	1,260,000	1,260,000	90	
14 D&D/Denativa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	
14 a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	
14 b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	
14 c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	
14 d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	
14 e	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	
14 f	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	247,059	247,059	247,059	90	
15	407,665	407,665	350,065	982,665	983,865	913,865	1,162,665	855,065	11,374,665	10,919,600	11,374,665	855,065	11,374,665	855,065	11,374,665	855,065	11,374,665	255,065	12,139,859	10,919,600	5,866,488	90
Filters General	86	86	14	86	50	50	86	14	14	14	14	86	14	14	14	14	14	14	12,139,859	10,919,600	5,866,488	90
Filters To Wor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90
Filters Worked	86	86	14	86	50	50	86	14	14	14	14	86	14	14	14	14	14	14	12,139,859	10,919,600	5,866,488	90
Total, Gallons	407,665	407,665	350,065	982,665	983,865	913,865	1,162,665	855,065	11,374,665	10,919,600	11,374,665	855,065	11,374,665	855,065	11,374,665	855,065	11,374,665	255,065	12,139,859	10,919,600	5,866,488	90
Cumulative Tot	5,671,412	6,021,476	7,004,141	7,988,006	8,901,871	10,064,535	10,919,600	11,374,665	11,629,729	11,884,794	12,139,859	12,139,859	12,139,859	12,139,859	12,139,859	12,139,859	12,139,859	10,919,600	5,866,488	90		
107,600	107,600	70,000	107,600	123,800	53,800	287,600	1,377,000	0	0	0	0	0	0	0	0	0	0	1,377,000	1,377,000	1,377,000	90	
734,200	804,200	911,800	1,035,600	1,089,400	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	1,377,000	9,542,600	90
231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	231,400	90
300,065	300,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	280,065	90
4,937,212	5,217,276	6,092,341	6,952,406	7,812,471	8,687,535	9,542,600	9,997,665	10,252,729	10,507,794	10,762,859	10,762,859	10,762,859	10,762,859	10,762,859	10,762,859	10,762,859	10,762,859	10,762,859	10,762,859	10,762,859	9,542,600	90
506,800	522,200	1,076,800	1,088,000	1,031,000	1,164,800	1,030,200	610,200	410,200	410,200	410,200	410,200	410,200	410,200	410,200	410,200	410,200	410,200	410,200	410,200	410,200	2,120	90

Appendix B
B-2

Waste Volume After PEW

CBM\TRIPPGE6.XLS Page 3 of 12

Goal Scenario. Incorporating J.L. Tripp Data for 3/27/96.

Waste number 0=minimal feed adjustment required; 1= sodium (Na) waste type; 2= non-sodium-acid-decon(H+) waste type.

Units in Gallons		Fiscal Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006		
Waste	Waste	PEW	HLLWE	Months of Calcination	0	11	7	5	12	1						
JLT#	Stream	Number	Factor	Rate									6	12		
1	NWCF Bed D	0	1	2 44% ANN 25000	0	50,000	25,000	0	50,000	25,000	0	0	0	25,000	50,000	
2	NWCF Ops	0	1	1 50% ANN Required	0	33,000	21,000	15,000	36,000	3,000	0	0	0	18,000	36,000	
3	NWCF Turn	2	1	2	0	0	28,000	0	0	72,000	0	0	0	0	0	
3	NWCF Turn	1	20	2	0	0	2,100	0	0	5,400	0	0	0	0	0	
4	PEW Direct	2	1	2	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	
5	603 removal	1	30	2	0	0	0	20,000	20,000	10,000	0	0	0	0	0	
6	640 Decon RO	1	20	2	0	0	500	500	500	0	0	0	0	0	0	
7	Decon 601	1	20	2	150	0	0	0	0	0	0	0	0	0	0	
8	Filter Leach	1	10	2	300	0	3,450	3,450	3,450	3,450	3,450	1,740	420	1,500	2,580	
9	T.F. Sumps	1	1	1	100	100	100	100	100	100	100	100	100	100	100	
10	LET&D	2	1	1	3,500	0	0	0	0	0	0	0	0	0	0	
11	T.F. Lines	1	1	1	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	
12	666 FSA deact	2	30	2	0	0	0	0	0	0	0	0	0	0	0	
13	PEW Bottoms	1	1	1	0	0	0	0	0	0	0	0	0	0	0	
13 a	NWCF Op	20	2		0	1,375	875	625	1,500	125	0	0	0	750	1,500	
13 b	FAST FSA	30	2		833	833	833	833	833	833	833	833	833	833	833	
14 c	FAST FDP	30	2		100	100	100	100	100	100	100	100	100	100	100	
13 d	Cell Floor	20	2		1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	
13 e	WCF Sum	30	2		133	133	133	0	0	0	0	0	0	0	0	
13 f	NWCF De	20	2		1,500	1,000	1,000	1,000	1,000	1,500	1,500	1,500	1,500	1,000	1,000	
13 g	LET&D	10	2		200	200	200	200	200	200	200	200	200	200	200	
13 h	603 Wet si	30	2		667	667	667	33	33	33	33	33	33	33	33	
13 i	603 Dry si	30	2		167	167	167	167	167	167	167	167	167	167	167	
13 j	Tank Farm	30	2		2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
13 k	Pilot Plant	10	2		100	100	100	100	100	100	100	100	100	100	100	
13 l	RCRA Wel	30	2		167	167	167	167	167	167	167	167	167	167	167	
13 m	Misc Bal o	30	2		1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	
13 n	PEW Desc	1	2		2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
13 o	Other INE	30	2		2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
14	D&D/Deactivation Activie	1	1													
14 a	WCF	1	1		0	0	0	0	0	0	0	0	0	0	0	
14 b	603 fuel st	10	2		0	0	1,500	1,500	2,000	0	0	0	0	0	0	
14 c	CPP-601	1	1		0	0	0	0	0	0	0	0	0	0	0	
14 d	TF Heelou	1	1		0	0	0	0	0	0	0	0	0	0	0	
14 e	FDP	1	1		0	0	0	0	0	0	0	0	0	0	0	
14 x	Discretion	1	2	Contingenc	0	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	11,765	
Filters Generated						14	80	160	44	86	20	14	14	14	50	86
Filters To Work Off					316	330	295	340	269	240	145	44	0	0	0	0
Filters Worked off						0	115	115	115	115	115	58	14	50	86	
Total, gallons						32,181	115,856	110,456	68,340	140,715	146,740	31,215	29,505	28,185	72,515	117,345
Cumulative Total, gallons						32,181	148,038	258,494	326,834	467,549	614,288	645,503	675,008	703,192	775,707	893,052
Portion from NWCF ops						0	84,980	77,360	15,900	88,160	105,580	0	0	0	44,080	88,160
Cumulative						0	84,980	162,340	178,240	266,400	371,980	371,980	371,980	371,980	416,060	504,220
Per Campaign(w/filter leach) avg=					181260			162,340		209,640						162,340
D&D portion (tot less NWCF)						32,181	30,876	33,096	52,440	52,555	41,160	31,215	29,505	28,185	28,435	29,185
Cumulative						32,181	63,058	96,154	148,594	201,149	242,308	273,523	303,028	331,212	359,647	388,832
Volume to HLLWE annually						15,817	69,992	76,592	40,475	91,850	130,875	18,350	16,640	15,320	41,650	68,480
Number of 3600 gallon batches						4	19	21	11	26	36	5	5	4	12	19

Appendix B
B-3

Waste Volume After PEW

CBM\TRIPPG6.XLS Page 4 of 12

Goal Scenario. Incorporati

Waste number

Units in Gallon

Waste

JLT# Stream

1 NWCF Bed D

2 NWCF Ops

3 NWCF Turn

3 NWCF Turn

4 PEW Direct

5 603 removal

6 640 Decon RO

7 Decon 601

8 Filter Leach

9 T.F. Sumps

10 LET&D

11 T.F. Lines

12 666 FSA deact

13 PEW Bottoms

13 a

13 b

14 c

13 d

13 e

13 f

13 g

13 h

13 i

13 j

13 k

13 l

13 m

13 n

13 o

14 D&D/Deactiva

14 a

14 b

14 c

14 d

14 e

14 x

Filters Generat

Filters To Wor

Filters Worked

Total, gallons

Cumulative Tot

2007

2008

2009

2010

2011

2012

2013

2014

2015

2016

2016

Total

Total
Thru 2012Total
2013 thru 2035
23 yrs

12

6

6

12

0

90

90

0

0

0

0

375,000

375,000

0

270,000

270,000

0

228,000

228,000

0

17,100

17,100

0

63,000

51,000

69,000

50,000

50,000

0

1,500

1,500

0

150

150

0

37,620

35,940

9,660

2,100

1,700

2,300

3,500

3,500

0

21,000

17,000

23,000

106,667

100,000

0

0

0

0

11,250

11,250

0

10,000

10,000

0

2,100

1,700

2,300

37,800

30,600

41,400

400

400

0

26,500

20,500

34,500

4,200

3,400

4,600

2,600

2,467

767

3,500

2,833

3,833

42,000

34,000

46,000

2,100

1,700

2,300

3,500

2,833

3,833

21,000

17,000

23,000

42,000

34,000

46,000

42,000

34,000

46,000

0

0

0

0

0

0

5,000

5,000

0

0

0

0

0

0

0

0

0

0

0

0

0

247,059

200,000

270,588

1,678,645

1,562,573

629,082

0

0

0

14

14

14

1,678,645

1,562,573

629,082

906,300

906,300

0

906,300

906,300

0

906,300

906,300

0

772,345

656,273

0

1,134,987

315

0

4

4

4

Appendix B
B-4

Waste Volume After HLLWE

CBM\TRIPPG6.XLS Page 5 of 12

Goal Scenario. Incorporating J.L. Tripp Data for 3/27/96.

Waste number 0= minimal feed adjustment required; 1= sodium (Na) waste type; 2= non-sodium-acid-decon(H+) waste type.

Units in Gallons					Fiscal Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Waste	Waste	PEW	HLLWE	Months of Calcination	0	11	7	5	12	1						6	12
JLT#	Stream	Number	Factor	Rate													
1	NWCF Bed D	0	1	2 44% ANN	25000	0	25,000	12,500	0	25,000	12,500	0	0	0	0	12,500	25,000
2	NWCF Ops	0	1	1 50% ANN Required		0	33,000	21,000	15,000	36,000	3,000	0	0	0	0	18,000	36,000
3	NWCF Turn	2	1	2		0	0	14,000	0	0	36,000	0	0	0	0	0	0
3	NWCF Turn	1	20	2		0	0	1,050	0	0	2,700	0	0	0	0	0	0
4	PEW Direct	2	1	2		1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
5	603 removal	1	30	2		0	0	0	10,000	10,000	5,000	0	0	0	0	0	0
6	640 Decon RO	1	20	2		0	0	250	250	250	0	0	0	0	0	0	0
7	Decon 601	1	20	2		75	0	0	0	0	0	0	0	0	0	0	0
8	Filter Leach	1	10	2	300	0	1,725	1,725	1,725	1,725	1,725	1,725	870	210	750	1,290	
9	T.F. Sumps	1	1	1		100	100	100	100	100	100	100	100	100	100	100	100
10	LET&D	2	1	1		3,500	0	0	0	0	0	0	0	0	0	0	0
11	T.F. Lines	1	1	1		1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
12	666 FSA deact	2	30	2		0	0	0	0	0	0	0	0	0	0	0	0
13	PEW Bottoms	1	1	1		0	0	0	0	0	0	0	0	0	0	0	0
13 a	NWCF Op	20	2			0	688	438	313	750	63	0	0	0	0	375	750
13 b	FAST FSA	30	2			417	417	417	417	417	417	417	417	417	417	417	417
13 c	FAST FDP	30	2			50	50	50	50	50	50	50	50	50	50	50	50
13 d	Cell Floor	20	2			900	900	900	900	900	900	900	900	900	900	900	900
13 e	WCF Sum	30	2			67	67	67	0	0	0	0	0	0	0	0	0
13 f	NWCF De	20	2			750	500	500	500	500	750	750	750	750	750	500	500
13 g	LET&D	10	2			100	100	100	100	100	100	100	100	100	100	100	100
13 h	603 Wet si	30	2			333	333	333	17	17	17	17	17	17	17	17	17
13 i	603 Dry si	30	2			83	83	83	83	83	83	83	83	83	83	83	83
13 j	Tank Farm	30	2			1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
13 k	Pilot Plant	10	2			50	50	50	50	50	50	50	50	50	50	50	50
13 l	RCRA Wel	30	2			83	83	83	83	83	83	83	83	83	83	83	83
13 m	Misc Bal o	30	2			500	500	500	500	500	500	500	500	500	500	500	500
13 n	PEW Desc	1	2			1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
13 o	Other INE	30	2			1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
14	D&D/Deactivation Activie	1	1			0	0	0	0	0	0	0	0	0	0	0	0
14 a	WCF	1	1			0	0	0	0	0	0	0	0	0	0	0	0
14 b	603 fuel st	10	2			0	0	750	750	1,000	0	0	0	0	0	0	0
14 c	CPP-601	1	1			0	0	0	0	0	0	0	0	0	0	0	0
14 d	TF Heelou	1	1			0	0	0	0	0	0	0	0	0	0	0	0
14 e	FDP	1	1			0	0	0	0	0	0	0	0	0	0	0	0
14 x	Discretion	1	2	Contingenc	0	5,882	5,882	5,882	5,882	5,882	5,882	5,882	5,882	5,882	5,882	5,882	5,882
Filters Generated						14	80	160	44	86	20	14	14	14	50	86	
Filters To Work Off					316	330	295	340	269	240	145	44	0	0	0	0	0
Filters Worked off						0	115	115	115	115	115	115	58	14	50	86	
Total, gallons						18,391	74,978	66,278	42,220	88,907	75,420	16,157	15,302	14,642	45,807	77,222	
Cumulative Total, gallons						18,391	93,369	159,647	201,867	290,774	366,194	382,351	397,654	412,296	458,104	535,326	
Portion from NWCF ops						0	58,990	49,180	15,450	62,080	54,290	0	0	0	31,040	62,080	
Cumulative						0	58,990	108,170	123,620	185,700	239,990	239,990	239,990	239,990	271,030	333,110	
Per Campaign(w/filter leach) avg=					117630			108,170		131,820						108,170	
D&D portion (tot less NWCF)						18,391	15,988	17,098	26,770	26,827	21,130	16,157	15,302	14,642	14,767	15,142	
Cumulative						18,391	34,379	51,477	78,247	105,074	126,204	142,361	157,664	172,306	187,074	202,216	

Appendix B
B-5

Waste Volume After HLLWE

CBM\TRIPPG6.XLS Page 6 of 12

Goal Scenario. Incorporati

Waste number
Units in Gallon
Waste

JLT# Stream

1 NWCF Bed D

2 NWCF Ops

3 NWCF Turn

3 NWCF Turn

4 PEW Direct

5 603 removal

6 640 Decon RO

7 Decon 601

8 Filter Leach

9 T.F. Sumps

10 LET&D

11 T.F. Lines

12 666 FSA deact

13 PEW Bottoms

13 a

13 b

13 c

13 d

13 e

13 f

13 g

13 h

13 i

13 j

13 k

13 l

13 m

13 n

13 o

14 D&D/Deactiva

14 a

14 b

14 c

14 d

14 e

14 x

Filters Generat

Filters To Wor

Filters Worked

Total, gallons

Cumulative Tot

15,050

348,160

14,642

216,858

2007

2008

2009

2010

2011

2012

2013

2014

2015

2016

Total

Total

Thru 2012

Total

2013 thru 2035

21

17

23 yrs

90

90

187,500

270,000

114,000

8,550

31,500

25,000

750

75

18,810

1,700

3,500

21,000

53,333

0

5,625

5,000

1,050

18,900

200

13,250

2,100

1,300

1,750

21,000

1,050

1,750

10,500

21,000

17,000

21,000

0

0

2,500

0

0

0

0

123,529

987,623

0

14

987,623

927,387

588,150

588,150

588,150

399,473

399,473

927,387

588,150

588,150

588,150

399,473

399,473

399,473

399,473

399,473

399,473

399,473

399,473

399,473

399,473

399,473

399,473

399,473

399,473

399,473

Average vol reduction thru HLLWE

Average vol reduction Overall

1.68

11.77

Appendix B
B-6

Waste Generation Data 3/21/96

Appendix B
B-7

Cumulative Waste Generation Data 3/21/96

Appendix B
B-8

Cumulative Dilute Waste Generation

Appendix B
B-9

Cumulative Volumes After PEW Evaporator

Cumulative Volumes After HLLWEvaporator

Appendix B
B-12

Goal Scenario. Incorporating J.L. Tripp Data for 3/27/96.														
Reduction of estimated future generation volumes.														
Number Campaigns		0	1	2	3	4	5	6	7	8	9	10	Sum	
Old Data	D&D	628,438	628,438	628,438	628,438	628,438	628,438	628,438	628,438	628,438	628,438	628,438	628,438	
	NWCF	161,000	0	161,000	322,000	483,000	644,000	805,000	966,000	1,127,000	1,288,000	1,449,000	1,610,000	
	Total	628,438	789,438	950,438	1,111,438	1,272,438	1,433,438	1,594,438	1,755,438	1,916,438	2,077,438	2,238,438	15767818	
New Data	D&D	339,237	339,237	339,237	339,237	339,237	339,237	339,237	339,237	339,237	339,237	339,237	339,237	
	NWCF	117,630	0	117,630	235,260	352,890	470,520	588,150	705,780	823,410	941,040	1,058,670	1,176,300	
	Total	339,237	456,867	574,497	692,127	809,757	927,387	1,045,017	1,162,647	1,280,277	1,397,907	1,515,537	10,201,253	
Delta		289,201	332,571	375,941	419,311	462,681	506,051	549,421	592,791	636,161	679,531	722,901	5,566,565	
Percent Reduction		46%	42%	40%	38%	36%	35%	34%	34%	33%	33%	32%	35%	
Reduction percent										D&D	46.0%			
										NWCF	26.9%			
										Average	35%			

Comparison of Old and New Waste Generation Streams

Evaluation of changes in individual waste streams for the period 1996-2012.						Matching of old to new data.							
WINCO-1192, Appendix B, Waste Generation Data 11/10/95.						New Data Developed March, 1996 by J. L. Tripp							
hlw-6ve.xls				Gallons	Gallons	trippge6.xls				Gallons	Gallons	Gallons	
JLT	Stream	Waste Number	HLLWE Factor	After PEW	After HLLWE	JLT	Stream	Waste Number	PEW Factor	HLLWE Factor	Total Dilute	After PEW	After HLLWE
1	NWCF Bed Diss	1	1	375,000	375,000	1	NWCF Bed Diss	0	1	2	375,000	375,000	187,500
2	NWCF Ops	1	1	270,000	270,000	2	NWCF Ops	0	1	1	270,000	270,000	270,000
3	NWCF Turn	1	3	43,500	14,500	3	NWCF Turn	2	1	2	228,000	228,000	114,000
3	NWCF Turn	1	2	21,600	10,800	3	NWCF Turn	1	20	2	342,000	17,100	8,550
3	NWCF Turn	2	1	195,000	195,000								
3	NWCF Turn	2	3	108,000	36,000								
4	PEW Direct	1	2	0	0	4	PEW Direct	2	1	2	51,000	51,000	25,500
4	PEW Direct	1	10	187,000	18,700								
4	PEW Direct	1	1	85,000	85,000								
5	603 removal	1	2	40,000	20,000	5	603 removal	1	30	2	1,500,000	50,000	25,000
6	640 Decon	1	2	1,000	500	6	640 Decon ROVER	1	20	2	30,000	1,500	750
7	Decon 601	1	2	2,303	1,152	7	Decon 601	1	20	2	3,000	150	75
8	Filter Leach	1	1	20,430	20,430	8	Filter Leach	1	10	2	359,400	35,940	17,970
8	Filter Leach	1	10	132,570	13,257								
8	Filter Leach	1	2	22,464	11,232								
8	Filter Leach	1	2	4,992	2,496								
9	T.F. Sumps	1	1	1,700	1,700	9	T.F. Sumps	1	1	1	1,700	1,700	1,700
10	LET&D Decon	2	1	137,500	137,500	10	LET&D	2	1	1	3,500	3,500	3,500
11	T.F. Lines	1	1	13,000	13,000	11	T.F. Lines	1	1	1	17,000	17,000	17,000
12						12	666 FSA deactivation	2	30	2	3,000,000	100,000	50,000
13	PEW Bottoms	1	2	170,000	85,000	13	PEW Bottoms	1	1	1	0	0	0
						13 a		1	20	2	225,000	11,250	5,625
						13 b		1	30	2	300,000	10,000	5,000
						14 c		1	30	2	51,000	1,700	850
						13 d		1	20	2	612,000	30,600	15,300
						13 e		1	30	2	12,000	400	200
						13 f		1	20	2	410,000	20,500	10,250
13g	LET&D Upset	1	2	1,000	500	13 g		1	10	2	34,000	3,400	1,700
13g	LET&D Upset	2	1	67,000	67,000								
						13 h		1	30	2	74,000	2,467	1,233
						13 i		1	30	2	85,000	2,833	1,417
						13 j		1	30	2	1,020,000	34,000	17,000
						13 k		1	10	2	17,000	1,700	850
						13 l		1	30	2	85,000	2,833	1,417
						13 m		1	30	2	510,000	17,000	8,500
						13 n		1	1	2	34,000	34,000	17,000
						13 o		1	30	2	1,020,000	34,000	17,000
						14 D&D/Deactivation		1	1	1			
14a	633 Decon WCF	1	2	4,750	2,375	14 a		1	1	1	0	0	0
14a	633 Decon WCF	2	10	60,000	6,000								
14a	633 Decon WCF	2	1	90,000	90,000								
14b	603 Decon	1	2	10,000	5,000	14 b		1	10	2	50,000	5,000	2,500
14c	Decon 601	2	10	6,000	600	14 c		1	1	1	0	0	0
14d	TFHO	1	1	0	0	14 d		1	1	1	0	0	0
14d	TFHO	1	10	0	0								
14d	TFHO	1	30	0	0								
14e	666 Decon	1	2	2,665	1,333	14 e		1	1	1	0	0	0
14e	666 Decon	2	1	45,000	45,000								
14e	666 Decon	2	10	45,000	4,500								
	601 Flushes	1	2	0	0	Completed							
	740 Decon	1	2	500	250	Completed							
	601 Flushes	2	1	0	0	Completed							
	601 Operation	2	1	0	0	Completed							
						15 Discretionary		1	1	2	200,000	200,000	100,000
				2,162,974	1,533,824						10,919,600	1,562,573	927,387

Comparison of Old and New Waste Generation Streams

[illegible]