



DEPARTMENT OF  
**ECOLOGY**  
State of Washington

## **Response to Comments**

**Modification of the *Hanford Facility*  
*Resource Conservation and Recovery Act*  
*Permit for the Treatment, Storage, and*  
*Disposal of Dangerous Waste, Part III,*  
**Operating Unit Group 10 (WA7890008967)**  
**Waste Treatment and Immobilization Plant**  
**8c.2016.4F**  
**December 28, 2015 through February 13,**  
**2016****

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*Summary of a public comment period and responses to comments*

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# **Response to Public Comments**

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## INTRODUCTION

The Washington State Department of Ecology's Nuclear Waste Program (NWP) manages dangerous waste within the state by writing permits to regulate its treatment, storage, and disposal. When a new permit or a significant modification to an existing permit is proposed, NWP holds a public comment period to allow the public to review the change and provide formal feedback. (See [Washington Administrative Code \[WAC\] 173-303-830](#) for types of permit changes.)

The Response to Comments is the last step before issuing the final permit, and its purpose is to:

- Specify which provisions, if any, of a permit will become effective upon issuance of the final permit, providing reasons for those changes.
- Describe and document public involvement actions.
- List and respond to all significant comments received during the public comment period and any related public hearings.

### **This Response to Comments is prepared for:**

Comment period: *Waste Treatment and Immobilization Plant (WTP) Modification 8c.2016.4F, December 28, 2015 – February 13, 2016*

Permit: *Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit Group 10 (WA7890008967), Waste Treatment and Immobilization Plant*

Original issuance date: *September 27, 1994*

Draft effective date: June 20, 2016

To see more information related to the Hanford Site or nuclear waste in Washington, please visit our website: [www.ecy.wa.gov/programs/nwp](http://www.ecy.wa.gov/programs/nwp).

### **REASONS FOR ISSUING THE PERMIT**

The Department of Ecology (Ecology) prepared a draft permit modification that incorporates new and modified design information for the *Hanford Facility RCRA Permit, Revision 8C, for the Treatment and Disposal of Dangerous Waste, Part III, Operating Unit Group 10, Waste Treatment and Immobilization Plant*, (WTP Permit).

The Low-Activity Waste (LAW) Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) System is the subject of the current modification. To ensure the quality of the LAW LOP/LVP design, Ecology reviewed the draft [Design and Operability Review and Recommendations Report](#) prior to the public comment period, and had areas of concerns.

As stated in the Statement of Basis for this draft permit modification, Ecology requested that the Permittees provide sufficient information to address those concerns before we could make a final decision regarding this permit modification.

The final Design and Operability Review and Recommendations Report was released on January 29, 2016. Ecology thoroughly reviewed the final report to determine if it identified additional concerns that were not included in the draft report.

Design and operability vulnerabilities were identified for the LAW LOP/LVP system, which could impact the equipment included in this modification. Ecology held extensive discussions with the Permittees regarding the identified vulnerabilities, and we believe our concerns have been addressed adequately. The following sections provide details about the design packages included in this permit modification.

***Design Package No. LAW-026A, Rev. 0, for Miscellaneous Unit Subsystems for LAW Facility LVP System (HEPA Preheaters LVP-HTR-00001A/B & -00003A/B)***

The LAW-026A permit design package addresses the design and installation of the high-efficiency particulate air (HEPA) preheaters, which are part of the LVP system at the 48 ft. elevation.

In the LVP system, melter offgas is combined with the vessel vent offgas which is heated in the HEPA preheaters to raise the offgas temperature above the dew point. The heated offgas is then dry enough to pass through HEPA filters, which remove particulates, before the offgas passes through the rest of the LVP system.

The LAW-026A design package was originally submitted for a 45-day public comment period from September 2 through October 20, 2014. As a result of public comments received during the public comment period, technical issues were raised that Ecology felt needed to be addressed prior to approval. Ecology withdrew this design package pending resolution of the unresolved issues and resulting corrective actions. The Permittees have addressed the outstanding technical issues and have revised and resubmitted the LAW-026A permit design package for this public review period.

***Design Package No. LAW-025, Rev. 0, for Miscellaneous Unit Subsystems for LAW Facility LVP System (Thermal Catalytic Oxidizer, Selective Catalytic Reducer, Electric Heater, and Heat Exchanger located on LVP-SKID-00002)***

The LAW-025 permit design package addresses design and installation of the thermal catalytic oxidizer, selective catalytic reducer, electric heater, and heat exchanger equipment which are part of the LAW LVP system. The equipment components are assembled into a single unit called a thermal catalytic oxidizer (TCO) skid, which is located on the 48 ft. elevation of the LAW facility.

In the LVP system, once the offgas passes through the HEPA filters, the filtered offgas is passed through activated carbon adsorption units which remove mercury, iodine, and acid gasses from the offgas stream, before being directed into TCO skid.

The TCO skid removes volatile organic compounds, carbon monoxide, and nitrogen oxides from the offgas stream. The offgas first passes through the heat exchanger to raise the temperature of the offgas. The electric heater will mainly be used to supplement the heat exchanger during startup.

The thermal catalytic oxidizer converts volatile organic compounds and carbon monoxide in the offgas into carbon dioxide and water vapor. The selective catalytic reducer converts oxides of nitrogen into nitrogen and water using ammonia.

This final reaction significantly increases the temperature of the offgas, so the offgas passes through the heat exchanger again to cool before it moves through the rest of the LVP System.

***Design Package No. LAW-028, Rev. 0, for the LAW Facility LVP System Miscellaneous Unit (LAW Melter Offgas Caustic Scrubber)***

The LAW-028 permit design package addresses the design and installation of the caustic scrubber which is part of the LAW LVP system, located at the 48 ft. elevation of the LAW facility.

In the LVP system, once melter offgas has passed through the thermal oxidizer skid, it is directed through the caustic scrubber. The scrubber removes residual acid gasses (primarily sulfur oxides and carbon dioxide) and provides further cooling of the offgas.

Liquid effluent from the caustic scrubber is recirculated through a caustic collection tank. The treated offgas is then discharged to the atmosphere through the LAW stacks. Exhausters provide the motive force for the offgas.

**PUBLIC INVOLVEMENT ACTIONS**

NWP encouraged public comment on the draft WTP Permit Modification during a 45-day public comment period held December 28, 2015, through February 13, 2016. We took the following actions to notify and involve the public:

- Mailed a public notice announcing the comment period to 1680 interested members of the public.
- Placed a public announcement legal classified advertisement in the *Tri-City Herald* on December 27, 2015.
- Emailed a notice announcing the start of the comment period to the [Hanford-Info email list](#), which has 1483 recipients.

The public information repositories located in Richland, Spokane, and Seattle, Washington, and Portland, Oregon, received the following:

- Public notice
- Transmittal letter
- Statement of Basis for the proposed WTP Permit Modification
- Draft WTP Permit Modification

The following public notices for this comment period are in [Appendix A](#) of this document:

1. Statement of Basis.
2. Public notice (Comment Period Summary).
3. Classified advertisement in the *Tri-City Herald*.
4. Notice sent to the Hanford-Info email list.
5. Posting on Ecology's Public Involvement Calendar.

**LIST OF COMMENTERS**

The table below lists the names of organizations or individuals who submitted a comment on the WTP Permit Modification and where you can find Ecology's response to the comment(s).

<b>Commenter</b>	<b>Organization</b>	<b>Comment Number</b>	<b>Page Number</b>
Mike Conlan	Citizen	1	5
Judy Pigott	Citizen	2	5 - 6
Anonymous	Citizen	3	6 - 28
Anonymous	Citizen	4	28- 30

## RESPONSE TO COMMENTS

### Description of comments:

Ecology accepted comments from December 28, 2015, through February 13, 2016. This section provides comments that we received during the public comment period and our responses as required by (RCW 34.05.325(6)(a)(iii)). NWP's responses directly follow each comment in italic font. Verbatim copies of all written comments are attached in [Appendix B](#).

### Comment #1, from Mike Conlan, December 23, 2015, and February 13, 2016

Dieter Bohrmann:

- 1) Remove all nuclear waste,
- 2) Do not allow anymore nuclear waste into the facility,
- 3) Replace all the single storage tanks,
- 4) Stop all the nuclear leakage entering the Columbia River.

Mike Conlan  
Redmond WA

### *Ecology Response to Comment #1:*

*Ecology is working to ensure that long-term storage, treatment, and disposal of the waste is protective of human health and the environment. The proposed permit changes are not to allow new waste, but to better manage the waste already at Hanford.*

*Single-shell tanks are not in the scope of this comment period. Ecology does agree the tanks pose a threat. We believe a better approach to addressing it is to transfer waste from the single-shell tanks to the double-shell tanks to prepare for eventual treatment in the Waste Treatment Plant.*

*Stopping any potential nuclear waste from impacting the Columbia River is not within the scope of the WTP Permit. Prevention of groundwater and surface water impacts are addressed in operations associated with other units.*

### Comment #2, from Judy Pigott, December 30, 2015:

Dieter - I have been following the work at Hanford, and have comments regarding two recent mailings:

1. *Ecology Proposes Changes to Waste Treatment Plant Design:* These sound well-directed, AS LONG AS they don't change the schedule/time line of the proposed clean up. If they did extend the clean up, then I'd think they, though sounding good, were a delay tactic.
2. *Changes to Part II Permit Conditions and Attachment 9 of the Hanford Site-wide Permit:* The difficulties here were known before. This seems intended to add another delay. Instead of doing as proposed, add resources to the current plan and move forward!

Thank you for giving me the opportunity to give "voice" to my perspectives — Judy

***Ecology Response to Comment #2:***

*The permit modification to the WTP Portion of the Hanford Dangerous Waste Permit includes design packages for the final design and installation of pieces of equipment for the LAW Facility Secondary Offgas/Vessel Vent Process System, in support of construction. The approval of this permit modification will support the timely operation of the LAW Facility. Changes to schedule or the timeline for cleanup were not within the scope of this permit modification.*

*This permit modification is for Waste Treatment Plant Permit design and installation of equipment in the LAW Facility. Changes to the Part II Permit Conditions and Attachment 9 of the Hanford Site-wide Permit were not within the scope of this permit modification.*

**Comment #3, Part I, from Anonymous, January 12, 2016:**

I. Pretreatment is the Only Permitted Source of Feed to the LAW Facility

In every document submitted for the DW Permit, the basis for feed to the LAW Facility is the WTP Pretreatment facility.

The permit package ignores new projects that will alter the feed and operation of the LAW Facility.

DOE and Ecology have acknowledged in court filings that the WTP Pretreatment Facility has failures that will result in design and process changes. For example, the DOE proposal of March 31, 2014 to amend the consent decree, states: “*the overwhelming technical judgment is that the WTP cannot operate under the current design, and therefore a new approach is needed.*” And: “*It has become clear...that unresolved technical issues could prevent the Pretreatment Facility from operating safely as currently designed.*”

The DOE proposal of March 31, 2014, includes “re-work” facilities planned in order to implement a “backfit” to a different feed process in response to the WTP design failure. These include Direct Feed Law Vitrification, (DFLAW) and a tank farm LAW Pretreatment System, (LAWPS), and a new end process Effluent Management Facility (EMF) which are new designs currently in the conceptual design phase. EMF is needed to manage wastewater that was previously routed to the WTP Pretreatment facility.

In spite of the admitted design failures in Pretreatment, the Chapter 4.0 Process Information located in the Permit Change Package does not contain any reference to DFLAW, LAWPS, or EMF. Instead it states that WTP will receive feed from the tank farms meeting envelope specifications A, B, C, and D, and “the waste feed will be stored and subsequently treated in the pretreatment facility prior to vitrification.” The process information is therefore no longer valid.

***Ecology Response to Comment #3, Part I:***

*As discussed in the Statement of Basis, the current WTP Portion of the Hanford Dangerous Waste Permit, Revision 8C is for construction. The equipment included in this permit modification is related to design and installation of Secondary Offgas/Vessel Vent Process System components in the LAW Facility.*

*Permit changes regarding the DFLAW process, including LAWPS and EMF, are outside the scope of this permit modification. However, you are correct, future permit modifications to the Hanford Dangerous Waste Permit will be required to support design and operation of those facilities.*

### **Comment #3, Part II, from Anonymous, January 12, 2016**

#### **II. The Pretreatment Permit Should be Cancelled**

DOE has proposed that Pretreatment cannot be corrected and started until December 31, 2039. As a result, the Pretreatment portion of the RCRA/Dangerous Waste Permit (DWP) should be rescinded, because the technical information in the permit is not valid. DOE's Brief to the District Court on November 13, 2015 states: "...*redesigning these facilities [Pretreatment and High Level Waste] in response to the technical issue resolution may require altering designs for equipment, components, or process...*" And DOE is not planning to have a redesigned and verified Pretreatment Facility Design until on or after December 31, 2024, according to DOE's proposed order, also dated November 13, 2015.

Pretreatment has multiple documented failures. Design changes through 2024 are expected. Despite knowing that the Pretreatment portion of the permit has "*a lot of information that is out-of-date; like for example the P&IDs*" DOE and Ecology agreed they were both "reluctant" to put a hold on the entire Pretreatment Facility in the Permit (see Section 5 of CCN-280037). The unsupported agreement is contrary to the WAC-173-303-803(4)(a) and WAC-173-303-806 requirements for a final, effective permit, prior to construction. A valid basis was not given for the agreed decision to maintain the obsolete PT Permit.

#### ***Ecology Response to Comment #3, Part II:***

*The Pretreatment Facility was not in the scope of this permit modification. However, placing the entire Pretreatment Facility on hold is not an option for Ecology. Ecology fully expects the Permittees to continue to resolve technical issues associated with Pretreatment Facility to meet their Consent Decree milestones, and to update the permit accordingly.*

### **Comment #3, Part III, from Anonymous, January 12, 2016**

#### **III. Feed Using the New Facilities has not been Analyzed**

The DFLAW early start retrofit process does not have a valid feed specification. This is documented in WTP Contract Modification 350, which is dated June 11, 2015. The "TBD" entry for DFLAW feed (Envelope E) is still in the current contract statement of work. This statement of work shows DOE will only comment on and not approve the new TBD feed specification for "Envelope E". This is a more lax approach than was used for the original feed specifications.

The DFLAW Feed has not been analyzed. DOE/Bechtel do not know if DFLAW is sized properly or if it will be durable or operate properly.

While DOE has released a hold on the basis of design document for including DFLAW, the accepted status is that "there is no single design document that bounds the design limits of the DFLAW configuration, *except those in place between PT and LAW.*" "When Envelope E is clearly defined in the contract, a *future* BODCN can address it." See the attachment to 15-WTP-0186. Note that 15-WTP-0187 also commits to creating design limits using a combination of ICD-30 (DFLAW Feed Interface, which also has TBDs) and the Process Inputs Basis of Design (PIBOD) calculation (WTP-DB-PET-09-001). The PIBOD calculation depends on Pretreatment for calculating the LAW Feed and so is not relevant to DFLAW. This approach is fraught with QA problems and will be forced to use assumptions that will be difficult, if not impossible, to verify. DFLAW starts with cesium removal in the tank farms. It will not have the same sodium additions for aluminum solubility and it will not have the same vessel washes or flushes or other chemical additions or recycles, as would occur in Pretreatment.

The above is contrary to the permit conditions that require valid design criteria and a valid mass and energy balance for a final effective permit.

Continued installation of the TCO/SCR, Caustic Scrubber, HEPA Preheaters, or any LAW equipment in the absence of a feed specification, proper design requirements and proper design-basis mass balance, is contrary to WAC-173-303-806 and represents a fraud on the public, perpetrated at the expense of safety.

***Ecology Response to Comment #3, Part III:***

*Permit changes regarding the DFLAW process are outside the scope of this permit modification. However, Ecology agrees that the Permittees will need to submit more information before we can proceed with the permitting of the Direct Feed LAW process. When the required information is submitted for future permit modifications, it will be made available for public review. Changes to the permit will be made to support the DFLAW process, and those modifications will be made in accordance with Washington Administrative Code 173-303-830. Ecology will ensure appropriate modifications are in place before final design certification and approval.*

*Envelope E designates bounding limits of the glass that will be produced once processed through the Direct-Feed LAW treatment configuration. The waste characteristics of this envelope represent a subset of the original waste characteristics that would be treated at the LAW Facility.*

*Regardless of where the waste is fed from, in order for the LAW Facility to receive waste, the feed will need to meet the bounding criteria for the facility. The DFLAW feed is anticipated to contain similar waste characteristics as feed that would come from the Pretreatment Facility. The bounding criteria for LAW feed accommodates some variability in waste characteristics, and adjustments to the waste can be made prior to transfer to meet the design capabilities of the equipment in the LAW Facility. However, if waste does not meet the LAW Facility bounding criteria, the waste will not be processed by the LAW Facility.*

*Confirmation sampling will be conducted prior to waste being fed to the LAW Facility to ensure waste acceptance criteria are met, as well as in the LAW Concentrate Receipt vessel before processing, to determine the glass formulation recipes needed.*

*The function of the LAW Facility will not change to accommodate the DFLAW process feed, so the offgas equipment included in this permit modification will meet the functional needs of the facility, based on the known waste characteristics of the feed that will be transferred to LAW. This equipment has been designed to comply with the Safety Basis for the WTP Facility. If the Safety Basis is revised, the equipment design will need to be reevaluated, and modified as necessary.*

**Comment #3, Part IV, from Anonymous, January 12, 2016**

**IV. The DW Permit Lacks a Valid Mass and Energy Balance**

The Statement of Basis provided by Ecology for the public review period identifies the Mass and Energy Balance for the WTP Permit, including the following in association with Permit Condition III.10.H.5.c.viii.

*Flowsheet Bases, Assumptions, and Requirements, 24590-WTP-RPT-PT-02-005, Rev 7, dated May 30, 2013. <http://pdw.hanford.gov/arpir/pdf.cfm?accession=0079066H>.*

*2010 WTP Material Balance and Steady State Flowsheet Assessment, Deliverable 2.7, 24590-WTP-RPT-PET-10-022, Rev 0, dated December 12, 2010, and Steady State (AES) Model*

*Run Report for 2010 Material Balance and Process Flowsheet Analysis Assessment Report, 24590-WTP-MRR-PET-10-010, Rev 0 dated December 6, 2010.*

None of these three documents addresses the mass, energy, or applicability of flowsheet basis technology development limits associated with Direct Feed LAW from the LAW Pretreatment System. They all rely on or describe feed from the (failed and outdated) Pretreatment facility. Flowsheet Deliverable 2.7 and the associated Steady State Model (AES) were eliminated from the WTP Contract and are no longer valid tools. As a result, Deliverable 2.7 for the steady state mass balance is absent from the current contract Statement of Work. The mass balance documents were also produced earlier than the most recent version of the *Flowsheet Bases, Assumptions, and Requirements* document (BARD).

The DW Permit Mass and Energy Balances are outdated and do not address the new LAW Pretreatment System, DFLAW, or the new Effluent Management Facility.

The Steady State Model further does not address the range of normal and expected operating conditions. The Steady State model was noted in 2009 as applying to only a small fraction of waste batches, according to an External Technical Review Team. Therefore it cannot project the range of normal operating conditions or establish nominal conditions (arising from the variety of individual feeds), as required in Permit Condition III.10.H.5.c.viii. It is out of date, uses the wrong unit operations, and is limited in scope. In addition, there is no tie to data tables in the Process Flow Diagrams (PFDs), which, contrary to best industry practice, have no data tables to show temperatures, pressures, pH, flow rates, or components of interest. This differs from other PFDs in the permit (such as for ETF).

The DOE-Bechtel Partnership plans to operate the LAW facility with feed from a new project (LAWPS) and to treat the resulting effluent using another new effluent management facility (EMF) instead of having a recycle to Pretreatment. LAWPS and EMF are new designs that are not incorporated in the DW Permit Process Flow Diagrams (PFDs) or in the WTP design basis mass balances (known as APPS/PIBOD and WEBPPS).

The DFLAW Retrofit, LAWPS, and EMF facilities are all in the conceptual design stage. These efforts so far are not using properly verified and validated software or appropriate design calculations, and they are not identifying assumptions requiring verification.

For example, a recent calculation (see RPP-RPT-59001) for a source term estimate for the EMF states that it contains “no assumptions.” This calculation is in addition based on the *not-to-be-used for design* HTWOS model. This calculation cannot accurately model EMF because there is no design-basis feed to DFLAW and HTWOS is not design quality software for WTP. So, despite the claim, there are unstated assumptions. The calculation therefore has no indication of the assumptions that require validation in order to be used for a design analysis.

The Hanford Tank Waste Operations Simulator (HTWOS) model is not validated for design use per NQA-1. The HTWOS model design document calls out clearly that HTWOS is a non-safety, non-quality affecting software application that is “not used in design activities.”

See RPP-50816 Pages 9 and D-9.

DOE does not know if the LAWPS project will have to add sodium to the tank waste in order to provide feed that would be the same as feed that would have come from the Pretreatment Facility. The failed Pretreatment flowsheet added sodium to leach aluminum and to keep aluminum in solution and prevent precipitation. Pretreatment also added other chemicals due to operations associated with acid recovery, tank flushes and acid cleaning, etc. DOE does not know what other chemical adjustments and costs might be needed in the LAWPS pretreatment facility to account for other chemical changes caused by the now absent Pretreatment Unit Operations. DOE does not

know the consequences of feeding the LAW Facility directly from tank farms without adjustment, as is planned.

If DOE does not adjust the LAWPS so that it matches the changes that would have been made in Pretreatment, then the LAW equipment is vulnerable to unknowns, including elevated ratios of corrosion causing compounds (chlorides and fluorides) to sodium, increased concentrations of acid gasses (SO<sub>x</sub>) and increased NO<sub>x</sub> flows for which the equipment was not designed. These changes are required to be subject to NQA-1 change control and configuration management processes, and must be analyzed before the design can be considered complete. To issue a permit and allow construction is not supported by the available data. If the thermal catalytic oxidizer is installed, it will be an irreversible action, as the roof will then be placed on the LAW facility, and there is no provision to replace the unit.

DFLAW is a retrofit process – it is a change process that requires careful analysis of the consequences of fundamental changes in input.

In addition, the new EMF facility depends on the operation of the upstream, unverified, LAW equipment. The flows in the submerged bed scrubber and the WESP impact the flow rate and composition in the EMF.

And EMF too is not reflected in the DW Permit Process Flow Diagrams or design basis mass balance. And Bechtel has cancelled the steady state flow sheet cited in the permit conditions, and DOE has removed it from the contract.

EMF calculations are not at the final design state – yet the calculation even go so far as to say there are “no assumptions.” This is a red flag that calls for a process and QA audit of the EMF design basis and the WTP mass and energy balances. Scoping evaluations using the tank farms HTWOS model are not valid as a validated and verified software tool for WTP design.

DOE will claim that the review of the impact of changing the feed process can “wait until commissioning.” This is not so. You cannot wait to analyze the changes until commissioning. First, the installations will be irreversible so there will be difficulty in replacing any non-usable or wrong-sized equipment. Second, commissioning will create lethal chemical hazards even if a non-radioactive simulant is used. Nitrates are a big part of the waste and they are converted to lethal NO<sub>x</sub> gas in the melter, even when the simulant is not radioactive. To postpone discovery of problems until commissioning is a fraudulent activity that is contrary to the Quality Assurance requirements of NQA-1 and to the requirements for integrating safety into the design (DOE-STD-1189). It also represents a corrupt means to achieve more rework, which is the primary product of this project.

### ***Ecology Response to Comment #3, Part IV:***

*Permit changes regarding the DFLAW process are outside the scope of this permit modification. Ecology agrees that more information will need to be submitted before we can proceed with the permitting of the Direct Feed LAW process. Ecology also expects to receive updated mass balance documentation for the Direct Feed LAW process. When that information is submitted in support of future permit modifications, it will be made available for public review.*

*Permit modifications to support the DFLAW process, including updated mass balance documentation, will be made public in accordance with Washington Administrative Code 173-303-830. Ecology will ensure appropriate modifications are in place before final design certification and approval.*

*Regardless of where the waste is fed from, in order for the LAW Facility to receive waste, the feed will need to meet the bounding criteria for the facility. The DFLAW feed is anticipated to contain similar waste characteristics as feed that would come from the Pretreatment Facility.*

*The bounding criteria for LAW feed accommodates some variability in waste characteristics, and adjustments to the waste can be made prior to transfer to meet the design capabilities of the equipment in the LAW Facility. However, if waste does not meet the LAW Facility bounding criteria, the waste will not be processed by the LAW Facility. Confirmation sampling will be conducted prior to waste being fed to the LAW Facility to ensure waste acceptance criteria are met. Sampling will also be conducted in the LAW Concentrate Receipt vessel before processing, to determine the glass formulation recipes needed.*

*The function of the LAW Facility is not anticipated to change for the DFLAW process, so the offgas equipment included in this permit modification will meet the functional needs of the facility based on the known waste characteristics of the feed that will be transferred to LAW. This equipment has been designed to comply with the Safety Basis for the WTP Facility. If the Safety Basis is revised, the equipment design will need to be reevaluated, and modified, as necessary.*

*For the Thermal Catalytic Oxidizer/Selective Catalytic Reduction (TCO/SCR), the mixed air and ammonia ratio is controlled to ensure the ratio is maintained below the flammability limit. The ammonia/air mixture is passed through the SCR catalyst to reduce nitrogen oxides (NOx) to nitrogen and water vapor, and is designed to achieve a NOx reduction of 98%. The catalyst has been designed to be replaced during operations. The Caustic Scrubber will operate at the very end of the offgas train. It is the final step in the treatment process before the offgas is pulled through the exhausters and out the LAW Facility stacks, and is used as a polishing step to remove residual sulfur oxides (SOx) and carbon dioxide.*

### **Comment #3, Part V, from Anonymous, January 12, 2016**

#### **V. The LAW Design has Unresolved Problems**

The DOE-Bechtel Partnership is aware of significant vulnerabilities as documented in a partial LAW Design and Operability Review (Pre-Decisional Draft) and elsewhere but has not resolved them.

Quality, Operability, and Safety Failures are Not Resolved and the Full Extent of Condition is Not Known. These problems affect permit conditions.

In addition to the LAW Design and Operability (D&O) Report, DOE has not completed a review of the remaining 13 interfacing LAW systems, which can impact equipment subject to the DW Permit. Contrary to testimony by DOE officials to the DNFSB on August 26, 2015, the LAW D&O Review was not a self-identified confirmation that all problems have been identified.

DOE Officials testified to the DNFSB on August 26, 2015:

*“It was a draft report that we commissioned ourselves...”*

*“to drive and identify all of the physical possible issues left to go and turn up all the rocks and question everything more than once”*

*“less than five percent of what is in that report is what we call new material”*

Contrary to this testimony, the LAW Design and Operability report was not commissioned by ORP, but was directed by the Chief of Nuclear Safety, in a letter dated January 28, 2014, as a result of an external construction project review.

Contrary to this testimony, the Design Review Plan, 14-WTP-0042, states this was a partial review of only some of the systems.

Other unresolved problems with the LAW Facility include:

- The Hazards Analysis is not complete. –DOE in letter 15-TRS-0026 notes that “the proposed control strategy for offgas events is underdeveloped and does not demonstrate

adequate protection of the facility worker in the event of an offgas system release to normally occupied areas.” This letter cites ammonia and carbon dioxide as potential hazards. Ammonia is a process chemical used in the LAW TCO/SCR.

Further, DOE letter 15-TRS-0029 approves a delay for the submittal of the LAW Facility Hazards Analysis and Preliminary Documented Safety Analysis (PDSA) change package until March 2016. It will require some time after that to complete the review and approval process. New safety structures, systems, and components for the LAW facility are expected to be proposed. Integration of safety in the design is incomplete.

As a result, WAC-173-303-806 effective final facility permit required contents are incomplete for the description of procedures, structures, or equipment used at the facility to mitigate effects of equipment failure and power outages, prevent undue exposure of personnel to dangerous waste, and prevent releases to the atmosphere.

- A 2015 Consent Order written by the DOE Office of Enforcement and signed by Bechtel included an \$800,000 fine associated with long-term safety integration and quality failures.
- The DOE Office of Inspector General found profound procurement and quality problems in Audit Report DOE-OIG-16-03. This report notes that, while Bechtel is using a Managed Improvement Plan (MIP), “Office of River Protection officials noted that Bechtel has initiated corrective actions in the past only to have the issues reappear over time.” The auditor’s comments included: “we disagree with management’s comment that the report did not identify any issues that had not been previously identified by either the Department or Bechtel. Our report acknowledges the issues identified by the Department and Bechtel. However, several new issues we identified in this report include the following: (1) the magnitude of the issue with nonconforming parts and material, (2) the Office of River Protection’s ineffective oversight over Bechtel’s backcharging practices, and (3) Bechtel’s problems resolving root causes of these issues.”

Quality defects in the procured equipment affect the safety function and show the need for detailed process and QA audits of the LAW equipment as applied to DFLAW feeds before a permit can be considered final and effective. While Bechtel is “in the process” of implementing corrective actions – those actions are not verified complete and do not address DFLAW interfaces. NQA-1 does not allow closing a corrective action to a promise for a future activity.

- Even now, the DOE Office of Inspector General is about to publish a delayed report titled “*Corrective Action Program at the Waste Treatment and Immobilization Plant.*” The review draft was dated June 2, 2015. The draft concluded that “the WTP corrective action program was not fully effective in managing and resolving issues.” Reliance cannot be made on *promises* or plans for corrections in the LAW facility as a result. While comments were transmitted in September 2015, the report is not yet issued, in spite of the OIG’s commitment to release such reports within 60 days after receiving management comments. Additional examples of failures in the Corrective Actions Management System are documented in Project Condition Reports, which have detected problems such as inadequate closure of corrective actions, inadequate tracking of condition reports, and corrective action management software failures. Movement of condition reports from one facility to another (“shell game”) has also hampered issue

tracking. Inconsistent labeling of systems (as noted in the LAW D&O report) makes it difficult to search or identify the full set of condition reports for equipment.

- DOE issued an Audit of Commercial Grade Dedication in August of 2015. Commercial Grad Dedication (CGD) is used to verify that the design meets its requirements and the equipment will perform its function. Specifically, when equipment has an assembly or component part that is a commercial grade item, NQA-1 requires that the characteristics of the item to be verified for acceptance and the acceptance criteria for those characteristics shall be documented. DOE's audit identified multiple CGD failures, including for LAW equipment and LAW Vendors associated with the current permit change request. Bechtel issued a "Level A" Condition Report, which is the most serious level of finding. Further, this is a repeat issue from a previous consent order and \$170,000 fine, NCO-2010-03. Persistent CGD issues and failures to show the equipment will perform its functions are not addressed in the Permit and the findings are not closed.

A "Final" Permit for any portion of the LAW Facility cannot possibly by [sic] called "complete" at this time. Final designs are needed to ensure verification of unverified assumptions, proper integration with upstream and downstream equipment, and resolution of indeterminate quality work.

***Ecology Response to Comment #3, Part V:***

*The LAW LOP and LVP System is the subject of the current modification. To ensure the quality of the LAW LOP/LVP design, Ecology reviewed the draft Design and Operability Review and Recommendations Report prior to the public comment period, and had areas of concerns.*

*As stated in the Statement of Basis for this draft permit modification, Ecology requested that the Permittees provide sufficient information to address those concerns before we could make a final decision regarding this permit modification.*

*The final Design and Operability Review and Recommendations Report was released on January 29, 2016. Ecology thoroughly reviewed the final report to determine if it identified additional concerns that were not included in the draft report.*

*Design and operability vulnerabilities were identified for the LAW LOP/LVP system, which could impact the equipment included in this modification. Ecology held extensive discussions with the Permittees regarding the identified vulnerabilities, and we believe our concerns have been addressed adequately. The following sections provide details about the design packages included in this permit modification.*

*Ecology will continue to engage with the Permittees regarding the vulnerabilities identified in the D&O report, as they relate to other systems within the LAW Facility, to ensure that the vulnerabilities are being addressed appropriately and corrective actions, if needed, are being implemented.*

*With regard to potential offgas release events, Bechtel National, Inc. (BNI) has performed several determinations and engineering evaluations, including a calculation that demonstrates C5V has the capacity and is capable to ensure the melter annulus remains under negative pressure with respect to the melter gallery, if the LAW primary offgas system fails.*

*In the secondary offgas train, the risk of ammonia release from the ammonia dilution skid is mitigated by placing the skid in an enclosed ventilated room, away from the general worker*

*gallery on the +48 ft. elevation, to prevent worker exposure. In addition, the LAW offgas system operates under negative pressure. In the event of equipment failure, air would flow into the offgas system rather than release offgas or ammonia into the facility.*

*The Hazards Analysis and Preliminary Documented Safety Analysis are not within the scope of this permit modification. Chapter 6 of the WTP Permit, Procedures to Prevent Hazards, currently fulfills the requirements of WAC 173-303-806 referenced in the comment. When the Hazards Analysis and LAW PDSA are updated, Chapter 6 of the WTP Permit will be updated, as appropriate, under WAC 173-303-830, which allows for the WTP Permit to be changed as design or documentation updates are made.*

*Ecology provides environmental regulatory oversight of construction and eventual operations at the WTP. We have no involvement or oversight regarding contractual negotiations that occur between the U.S. Department of Energy (DOE) and their contractors.*

*Ecology agrees that more information will need to be submitted before we can proceed with the permitting of the Direct Feed LAW process. When that information is submitted, it will be included in support of future permit modifications, and it will be made available for public review. Permit modifications to support the DFLAW process will be made in accordance with Washington Administrative Code 173-303-830. Ecology will ensure appropriate modifications are in place before final design certification and approval.*

*The Office of Inspector General (OIG) review identified and documented issues that were concurrently being addressed through BNI's root cause evaluation, and the ORP October 2013 Priority 1 findings. These reviews resulted in improvements to the WTP Quality Assurance Program and Corrective Action Management Plan. The Permittees will continue to identify deficiencies and develop corrective actions to address the deficiencies.*

*DOE performed an audit of the Commercial Grade Dedication (CGD) program in 2015 that resulted in a change to the WTP CGD program. At the end of the DOE audit, several actions were identified, resulting in the development of a new program that aligns with the DOE requirements. Compensatory measures were put in place until Subject Matter Experts were identified, vendor documentation was resubmitted, and required procedures were revised. This is a DOE requirement and DOE has determined that the revised CGD program has been successfully implemented.*

### **Comment #3, Part VI, from Anonymous, January 12, 2016**

VI. Ecology has Violated WAC-173-303-803(4)(a)

As shown above, the information necessary for a final, effective permit as required by WAC-173-303-803(4)(a) does not exist.

Ecology has allowed construction before having a Final/Effective Permit. Ecology's decision to allow a phased approach to permitting is not valid.

Of note is that Ecology has responded to previous comments by referring to a previous decision to make an exception to this requirement. Ecology's previous decision is no longer valid, as shown below.

Ecology's response to comments in Publication 14-05-004 referred to a Fact Sheet, (Ecology Publication 01-05-005, dated September 2002) to describe the "phased permitting approach" approved by Ecology in 2002 for the WTP permit. This phased approach allowed DOE and Bechtel to submit design information into the permit and to continue construction before a

complete design was available. This has been contrary to WAC-173-303-803(4)(a) for a period of more than 13 years.

Ecology's Publication Web Page for publications shows that the fact sheet from September 2002 is actually Publication 01-05-006.

The 2002 Fact Sheet states the basis for Ecology's decision to ignore the requirement for final design before construction was schedule pressure: "*The amount of time it would take to complete the detailed design and follow a traditional permitting process would delay construction up to four years.*" But many more than 4 years have passed. If construction had been delayed to wait for a final, integrated design, much time and billions of dollars could have been saved. Instead, this failed decision has contributed to a stove-piped cycle of endless rework.

Nor has the risk reduction anticipated in Publication 01-05-006 occurred. There will be no "*treatment through verification, of at least 10% of the tank waste by volume and 25% by radioactivity by 2018.*" Indeed – the current DFLAW process just dumps removed cesium-137 back into the tanks.

In publication 01-05-006, Ecology relied on Bechtel's claims of success with fast track design-build for other projects as a basis: "*The Bechtel Group, including BNI, has successfully used the close coupled EPC process for decades to design and construct major capital projects across the industrial sectors Bechtel supports.*" However no specific nuclear success examples were cited and no such success has occurred as promised at WTP.

Ecology was not alone in approving fast track construction before final design. DOE also approved a fast track design-build approach where construction is allowed without having a final design for all interfacing equipment and systems (stove-piped approach) in 2003, but recently and clearly rejected that as a good decision (in addition to the prohibition already contained in DOE Order 413.3B). The Secretary of Energy issued a letter on December 1, 2014, with an attached Report of the Contract and Project Management Working Group. This report states in the Section 5.4.4 Case Study of WTP that "*The use of a fast track approach for first of a kind nuclear plan consisting of multiple nuclear facilities was a bad acquisition approach. It is the primary factor for the significant cost increases and schedule delays that have ensued over the years. There continues to be significant performance risk associated with this project.*"

Further, the Secretary of Energy elaborated on June 8, 2015 that before achieving Critical Decision 2, which precedes construction, nuclear construction projects are required to have a 90 percent final design complete (for the whole project). And this letter includes a definition of 90 percent final design and required documents ahead of construction to mean:

- Complete final drawings and specification that may be released for bid and/or construction
- A current and detailed cost estimate
- A current construction schedule
- Clearly defined testing requirements and acceptance criteria for the safety and functionality of all subsystems
- Independent technical, construction, operation and environmental reviews of the final drawings and specifications
- A quality control review that evaluates both technical accuracy and discipline coordination
- A final design that meets all the requirements stipulated in the Code of Record
- A final design review that should be merely be a final validation of comment resolution from previous reviews and a review of any additional developments since the last review

- The checking and verification of any required waivers or exemptions
- Final design report
- Final design review report
- Preliminary documented safety analysis
- Safety evaluation report

No such set of information is available for the LAW facility, the DFLAW retrofit project, the LAWPS project, or for the Effluent Management Facility, which are all interlinked. These designs cannot be made final in pieces without repeating the consequences of the design-build primary-cause acknowledged failure.

DOE has rejected fast track Design-Build. Why should Ecology allow it to continue with the present permit package? Ecology's phased approach decision from 2002 should be revoked.

***Ecology Response to Comment #3, Part VI:***

*The Statement of Basis for these permit packages explains the permitting process for WTP and states the following:*

*“We are using a phased (or stepped) approach to permit the WTP Treatment Storage and Disposal Unit. The first phase was completed on September 25, 2002, with issuance of a final Dangerous Waste Permit allowing construction of the LAW, PTF, HLW, LAB, and BOF facilities to start.*

*A WTP Interim Compliance Schedule for the Permittees provides Ecology additional detailed information addressing the submittal of design documents necessary to support construction of the rest of the WTP TSD Unit, and its eventual operation. This second phase of permitting is included in the interim compliance schedule, and requires the Permittees to submit design and other information for Ecology approval before regulated portions of the WTP TSD Unit are constructed.*

*The third phase of permitting is implementation of the last portion of the interim compliance schedule. This requires updating portions of the Dangerous Waste Permit Application and then modifying the WTP Permit prior to facility start-up operations. These portions (for example, Contingency Plan, Closure Plan, and Training Plan) of the WTP Permit are operational in nature and cannot be completed before the design is nearly complete.*

*When the three phases of permitting are completed, the WTP TSD Unit will comply with all the applicable requirements of WAC 173-303. Then, after receiving written permission from Ecology, the Permittees can begin treatment and storage of dangerous and mixed waste at the WTP. The design submittals (second permitting phase) were structured to allow the Permittees to provide design information in roughly the same order as the WTP facilities are constructed.”*

*Ecology is continuing along this path as originally intended with the three phases of permitting. New facility permits or modifications to the existing WTP Permit will be made, as appropriate to accommodate the DFLAW process. Ecology is disappointed that there continue to be delays in the original construction schedule. Ecology shares your concern about the long duration and high cost of construction at the WTP. We are committed to ensuring that the WTP is constructed in a safe and timely manner, to facilitate treatment and disposal of tank waste at the Hanford site.*

### **Comment #3, Part VII, from Anonymous, January 12, 2016**

#### **VII. Quality and Safety Problems Persist**

In Publication 14-05-004 Ecology responded to public comments on the permit in 2013 by promising to conduct quality determinations: *“Ecology is undertaking several quality determination measures for equipment or systems that have already been constructed, as well as for components that have not yet been installed.”*

Ecology’s Commitments to the Public to perform Quality Reviews and to rely on completed Safety Reviews is not met.

- Contrary to Ecology’s Commitment to a quality review, the response to comments on installation of the LAW Preheater (See Publication 15-05-004) was to withdraw the 2014 proposed installation due to issues raised by the public. The public comments included unacceptable materials of construction and an inadequate process corrosion data sheet. Ecology withdrew the permit modification request, noting that there were “significant unresolved issues.”

What did Ecology do to review quality before allowing the current design package?

Further, Ecology committed in the 2002 Publication 01-05-006 to using DOE’s safety evaluation documents to verify safety. Why then does Ecology accept the incomplete hazards analysis for LAW equipment (See 15-TRS-0029), even specific to the ammonia used in the TCO/SCR? Why does Ecology accept continued construction with the outstanding \$800,000 fine for safety failures and corrections not completed in the 2015 Office of Enforcement Consent Order?

Below are comments on the specific documents in the proposed change package that demonstrate persistent quality problems. Please note that these comments are a few examples from a cursory review.

#### ***Ecology Response to Comment #3, Part VII:***

*To ensure the quality of the LAW LOP/LVP system design, Ecology reviewed design package documentation submitted by the Permittees, as required by WAC 173-303-640 and -680, and to satisfy permit condition III.10.H.5.c. In addition, Ecology requested from the Permittees documentation, such as Project Issues Evaluation Reporting System reports, condition reports, and other change documentation, on open issues as they related to the subject equipment or design. Ecology requested that the Permittees provide those documents detailed in this comment, for our review.*

*We have reviewed this documentation and discussed technical issues with the Permittees as they pertain to the equipment included in this modification. Ecology also conducted a thorough review of the LAW Design and Operability Review and Recommendations Report, and we believe the Permittees have adequately addressed our concerns as they relate to the LAW offgas equipment included in this permit modification.*

*Chapter 6 of the WTP Permit, Procedures to Prevent Hazards, currently fulfills the requirements of WAC 173-303-806 to mitigate the effects of equipment failure and power outages, and to prevent undue exposure of personnel to dangerous waste. When the Hazards Analysis is updated, Chapter 6 will be updated accordingly, under WAC 173-303-830, which allows for the WTP Permit to be changed as design or documentation updates are made.*

*In the secondary offgas train, the risk of ammonia release from the ammonia dilution skid is mitigated by placing the skid in an enclosed ventilated room, away from the general worker gallery on the +48 ft. elevation, to prevent worker exposure. In addition, the LAW offgas system operates under negative pressure. In the event of equipment failure, air would flow into the offgas system rather than release offgas or ammonia into the facility.*

*Ecology provides environmental regulatory oversight of construction, and eventual operations at the WTP. We have no involvement or oversight regarding contractual negotiations that occur between the DOE and their contractors.*

## **CAUSTIC SCRUBBER COMMENTS**

On the Caustic Scrubber Data Sheet 24590-LAW-MKD-LVP-00011, Rev 6 there is a reference to Note 7 (see pages 10 and 11). Note 7 (page 12) states that the vendor will provide a verification/supply the pH operating conditions. Contrary to this note, no vendor operating inputs were provided.

The corrosion evaluation 24590-LAW-N1D-LVP-00001, Rev 7 assumes that the nominal pH will be 9.5 (see page 3), without a basis that explains this. However, Section 4 and the conclusion of the corrosion evaluation (sheets 4 and 6) state that “In the region of the scrubber where there is potential for high temperature, presence of acid gases, and the potential use of acid for cleaning, Hastelloy® C-276 or C22® offer resistance to corrosion both at low pH from acid gas and high pH from the sodium hydroxide.”

There is no means to control the caustic scrubber wall temperature. Conduction is ignored.

This is not safe-by-design.

Sheet 2 of the corrosion evaluation (operating restrictions) then indicates that the process will be controlled to meet the corrosion limits for type 316 stainless steel, which makes up the sides, but not the bottom of the scrubber. So – Bechtel has modified the chemical process to match the side wall material already selected in a non-conservative way (assuming a lower temperature). Bechtel did not select materials that match the process. And the process is not understood. There is no engineered feature to control temperature up the side walls of the scrubber. The requirements for nuclear design include a hierarchy that requires a robust design as a priority over administrative or operational controls (DOE-STD-3009). This philosophy has been abandoned for the caustic scrubber in the haste for installation.

The design limits in the corrosion evaluation (sheet 6) are limited to a range of pH of 5 to 10, without recourse to a vendor input. The design limits cite 24590-WTP-RPT-M-11-002, which is not a vendor document, but refers to conditions suitable for type 316 stainless steel. The corrosion evaluation data table (sheet 9 of 24590-LAW-N1D-LVP-00001, Rev 7), however shows the pH of the liquid input to the scrubber as **11.43** (noted as not being a maximum), which *exceeds the corrosion analysis range*.

The corrosion evaluation shows (sheet 13) that caustic is added at 5M NaOH. This concentration is more than sufficient to generate a pH 14 solution. Sheet 13 also notes that the pH can be raised to 14 in normal operations if needed to control high halide concentrations.

The Flowsheet Bases, Assumptions, and Requirements Document (BARD), 24590-WTP-RPT-PT-005, Rev 7 says that the caustic scrubber solution is supposed to be at a concentration of 0.01 Molar NaOH (See page 2.13-9). This is the same as a pH of 12.

At a pH of 12, the caustic scrubber is assumed to remove a fixed fraction of contaminants (per BARD Table 2.13-4 (pages 2.13-21 and 2.13-22). There is no mention of how much less is removed if the pH is reduced below 12 to the amount required by the corrosion analysis. The

results will increase the effluent flow rate, because of the reduction in efficiency. There is no indication in the BARD of the sensitivity of operations to changes in pH.

The engineering specification to the vendor (24590-LAW-3PS-MKAS-T0001, Rev 2, page 13) shows that Bechtel told the vendor that the scrubber must remove 97% of SO<sub>x</sub> gas “with the scrubber reagent “between pH 9 and pH 14”. The vendor was told that the solution would or could be between pH of 9 and 14. This sheet also specifies that the vendor was supposed to provide the optimal range for pH. In addition, acid conditions in the scrubber identified in the corrosion analysis (pH of 5) were not included in the specification provided to the vendor.

So – the Permit request package is internally inconsistent – stating that the design range is 5 to 10 in the corrosion evaluation, but ordering a system that can operate between pH of 9 and 14 (to be determined by the vendor), and using a flowsheet that assumes a pH of 12. The impact on operations is unknown (safety and quality indeterminate).

In addition, drawing 24590-QL-POA-MKAS-00003-04-00050 Rev 0E does not identify the material of construction for the internal structure and packing support in the scrubber. Nor does this drawing have a corrosion allowance for the packing support. Will it be durable under both the full range of caustic and acid flush conditions?

Also, the IQRPE Structural Integrity Assessment Report, 24590-CM-HC4-HXYG-000240-02-00013, Rev 0A relies on and references non-final design calculations for Stress Analysis and for Anchor Bolt and Embed design. Both of these are preliminary letter revision calculation. See page 5, for example. This problem has occurred in prior permit change proposals.

- DOE and Bechtel are also aware that:

Condition Report 24590-WTP-GCA-MGT-15-00813, dated 05-21-15 indicated that Bechtel did not understand the Vendor’s “finite element analysis.”

Condition Report 24590-WTP-GCA-MGT-15-00886, dated 06-09-15 indicated that Bechtel knew it did not have a supplier calculation checklist for the off-gas caustic scrubber process, and this was part of a Level A (PL-1) corrective action.

Condition Report 24590-WTP-GCA-MGT-15-00963, dated 06-17-15 indicated that Bechtel lacked documentation of the Caustic Scrubber Vendor’s design analysis software.

Condition Report 24590-WTP-GCA-MGT-15-01214, dated 07-29-15, indicated that Bechtel was aware of an attempt to change the operating conditions to reduce the pH, and “believed,” based on the basis of “we are told” that increasing the pH to 14 would be detrimental to operating efficiency. This is without benefit of understanding the vendor software. No basis was provided.

Condition Report 24590-WTP-GCA-MGT-15-02162, dated 12-08-15, indicated a lack of basis for flow rates and vessel sizing, including for caustic scrubber operation.

- DOE and Bechtel are aware of Caustic Scrubber design problems identified in the recent draft LAW Design and Operability Report (factual accuracy is documented in the Record of Review forms), specifically:

Ammonium hydroxide could require removal or flushing (LOP/LVP-18)

There is no way to remove an accumulation of insoluble solids (LOP/LVP-44)

The effects from other unit operations on the startup and shutdown have not been fully analyzed (LOP/LVP-45)

There is no direct means to monitor the condition of the packing or mist eliminators within the caustic scrubber.

The design for removal/replacement for waste handling for the caustic scrubber is incomplete (LRWH-F-06-V-01).

In addition, a recent Commercial Grade Dedication (CGD) Audit Report, 15-QAD-0038, transmitted to Bechtel on August 6, 2015 specifically calls out findings associated with Premier Technologies (the caustic scrubber vendor) and the caustic scrubber itself. For example: **“Review of Premier Technologies, Inc. Commercial Grade Dedication Procedure** *The Premier Technologies, Inc. (PTI) CGD procedure, TP-3.4, Commercial Grade Dedication, Rev. 5, dated February 23, 2013, contained several instances in which the requirements of BNI specification 24590-WTP-3PS-G000-T0019 were not included in the procedure or, if included, were optional. Examples include:*

- Technical evaluation
- Seismically or environmentally qualified items
- Method 1 misconceptions
- Method 2 misconceptions
- How to deal with other ASME certifications during CGD (PTI Quality Assurance Manual 1.3).

*BNI did not identify this nonconformance and require correction of the condition by the supplier.*

**21. PTI Technologies [Premier Technology Inc.] – CGD 11-80 – ASME SA240, 316L (UNS S31603) Plate**

- The PTI CGD Plan, No. 11-80, supporting Purchase Order 99896, for ASME SA240, 316L (UNS N10276) Plate did not provide sufficient evidence that the plate steel[sic], which was being used to fabricate the caustic scrubber vessel, head, and internals that form the pressure vessel boundary could perform its safety function. The CGD plan and documentation of testing contained errors, specifically:
  - The technical evaluation used the Boiler and Pressure Vessel Code (B&PVC) UNF-65 allowance to not perform brittle fracture testing; however, the technical evaluation did not discuss or contain the additional evaluation for suitability testing that is discussed in the UNF-65 allowance.”

These examples show that the caustic scrubber is not ready for installation. DOE and Bechtel were aware of these problems before sending the permit change request to Ecology.

As a result the taxpayer will be paying to have it “fixed” in place later, or there will be pressure not to fix it at all.

***Ecology Response to Comment #3, Part VII, Caustic Scrubber Comments:***

*As compared to the submerged bed scrubber, which is operated at the head end of the LAW secondary offgas system, the Caustic Scrubber will operate at the very end of the offgas treatment train. It is the final step in the treatment process before the offgas is pulled through the exhausters and out the LAW Facility stacks, and is used as a polishing step to remove residual SO<sub>x</sub> and carbon dioxide.*

*The design of the scrubber is based on results from testing conducted between 2001 and 2004. The 40-year sheet metal design life is based on removal of the acid, particulates, and SO<sub>x</sub> from the offgas. The caustic scrubber is designed with inspection ports to allow for the design plate media to be inspected. Currently, the frequency of inspection is recommended for every 5 years. Although not expected to require replacement, the caustic scrubber internals have been designed to be replaceable.*

*The pH of the caustic scrubber solution is an operational parameter. The wide pH range was initially specified for this equipment early in the system design when it was thought that this flexibility was needed, to account for a large pH change as the solution reacted with the acid gases in the scrubber. It was thought that there would be a high solution pH at the top of the scrubber, and that the pH would drop several points by the time the scrubber solution reached the bottom. However, as discovered during testing, there is a buffer reaction that occurs in the caustic solution. As a result, the pH of the solution is maintained within a very narrow range, between 9.5 and 10.0, all the way through the scrubber.*

*The corrosion evaluation has evaluated the initially specified wide range of acceptable solution pH and the material compatibility to those conditions. Page 2 of the corrosion evaluation indicates that the materials of construction can handle a pH of up to 14 with no deleterious effects.*

*The pH of the buffer solution is determined by the ratio of sodium carbonate to sodium bicarbonate. While carbonate salt is being depleted by chemical reaction with absorbed acids, additional carbonate salt is being generated from carbon dioxide absorption. The sodium hydroxide is added to the caustic collection tank to reverse the reaction by reacting with sodium bicarbonate to reform sodium carbonate, which restores the full buffering capacity of the solution. Restoring the buffer solution capacity also restores the original solution ratio of sodium carbonate to sodium bicarbonate and pH, prior to recirculation back to the top of the packed section of the caustic scrubber.*

*The buffer solution recirculation rate is limited by the tower design and must be controlled below the packing flood point. At the designed 200 gpm maximum solution recirculation rate to the top of the packing and operating within the design solution pH range from 9.5 to 10, the free hydroxide delivered to the packing is less than 2% of the caustic demand needed to neutralize all of the acid adsorbed into the solution. As the solution travels to the bottom of the packing, additional acid neutralization capability must come from within the buffer solution as it travels down through the packing.*

*The vendor supplied the pH operating conditions in the Process Calculation 24590-QL-POA-MKAS-00003-06-00001. Section 5.8 of the calculation recommends that the pH of the scrubber solution be continuously monitored to be able to adjust the amount of caustic solution added, to keep the pH within the range of 9.5 to 10. The mechanical data sheet will be revised to reflect this, and a permit modification will be submitted to Ecology to update the mechanical data sheet in the WTP Permit.*

*BNI conducted the open condition report on the finite element analysis. The condition reports written against the Caustic Scrubber were against supplier calculations and documentation, via software qualification, supplier checklists, etc. None of the condition reports are expected to change the answer, the condition reports are written to ensure that the quality pedigree is met.*

*The condition reports are generated to document and resolve many items, including Nuclear Safety Quality issues. BNI requires use of the Condition Report system to ensure they are resolved prior to completion of the work activities.*

*The documentation of items to be resolved will continue through the life of the WTP Project. If resolution of condition reports results in design modifications that affect the permit, then those changes will go through the permit modification process as required under the Washington Administrative Code 173-303-830.*

*The design calculations for Stress Analysis and for Anchor Bolt and Embed design referenced by the IQRPE are committed calculations. WTP procedure 24590-WTP-3DP-G04B-00037, Rev. 29,*

*Exhibit A: Definitions defines the term Committed Calculations: “Committed calculations (designated with alpha revisions) may be utilized in final design documents prior to being confirmed. These calculations contain assumptions that require verification.”*

*To ensure the quality of the LAW LOP/LVP system design, Ecology conducted a thorough review of the LAW Design and Operability Review and Recommendations Report, and we believe the Permittees have adequately addressed technical issues as they relate to the caustic scrubber.*

*DOE performed an audit of the Commercial Grade Dedication (CGD) program in 2015, which resulted in a change to the WTP program. At the end of the DOE audit, several actions were identified that resulted in the development of a new CGD program that aligns with the DOE requirements. Compensatory measures were put in place until Subject Matter Experts were identified, vendor documentation was resubmitted, and required procedures were revised. This is a DOE requirement, and DOE has determined that the revised CGD program has been successfully implemented.*

### **TCO/SCR COMMENTS**

Note that the Thermal Catalytic Oxidizer/Selective Catalytic Reduction (TCO/SCR) has previously also been called the “SCO,” complicating searches for PIERS and Condition Reports.

- In 24590-CM-HC4-HXYG-00240-02-00012, Rev 0A, the IQRPE Assessment refers to a Rev “A” calculation as input in 4 places (pages 6, 7, 8, and 9). The calculation is 24590-LAW-MVC-LVP-00004, Rev. A, LVP-SKID-00002, *LAW Thermal Catalytic Oxidizer/Reducer, Stress Analysis with ANSYS*, including ECCN # 24590-LAW-MVE-LVP-00001. Rev “A” design documents are for conceptual design and are not suitable for final design or construction.
- In 24590-CM-HC4-HXYG-00240-02-00012, Rev 0A, the IQRPE Assessment refers to **24590-LAW-M4C-LOP-00001**, Rev. 3, *LAW Melter Offgas System Design Basis Flowsheets* including ECCN # 00003 and 00009 (page 10). However, the remainder of the change package, including the References for Data Sheet 24590-LAW-MKD-LVP-00012, Rev 12, refer to a different document **24590-LAW-M4E-LOP-00009**, with the same title: *LAW Melter Offgas System Design Basis Flow Sheets*. The results for NOx concentrations differ in these two calculations, but they have the same title. Neither flow sheet is provided in the permit change package. No dates are given for their publication.
- In 24590-CM-HC4-HXYG-00240-02-00012, Rev. 0A, the IQRPE Assessment refers to a Rev “C” calculation for hydrogen generation – 24590-WTP-M4C-V11T-00004, Rev. “C,” *Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP*. Again – a letter revision is not suitable for final design or construction.
- The TCO/SCR change package does not mention the DFLAW process or project. This project will change the feed to the LAW facility such that the concentrations of key components will be changed due to the elimination of additions and dilutions from the WTP pretreatment facility. Concentrations of organics and NO and NO<sub>2</sub> in the gas phase will likely change. As a result, the ability of the LAW TCO/SCR to treat the new concentrations and mass flows is unknown. Further, WTP contract Mod 353 to section H, establishes DOE-Directed waste acceptance criteria and design inputs, per letter 15-WTP-0023. Contract Mod 353 states that: “It is acknowledged by the parties that changes to these critical design inputs may materially impact the Contractor’s ability to

complete CLIN 2.1 and give rise to relief pursuant to the Changes clause of the contract.” DOE has therefore acknowledged that the non-design-basis quality inputs in letter 15-WTP-0023 may result in changes to the LAW facility, which includes the off-gas system and the LAW-TCO. And these changes are *expected* to produce rework.

- 24590-WTP-RPT-PT-005, Rev 7, *Flowsheet Bases, Assumptions, and Requirements Document* (BARD) is cited in the change package as a basis for the WTP RCRA Permit. However, this document itself refers to Revision A (Conceptual Design) information in several places. Nor does it address the changes from DFLAW. Further, the BARD contains only “expected” decontamination factors for the TCO (see page 3.3-16), and these are fixed values so changes in temperature, which affect the efficiency of the catalysts, are not accounted for in the flowsheet calculations (see page 3.3-40). Nor are the changes in the off-gas composition accounted for. The DFs are assumed to be 50 (reduction of 98% for NO and NO<sub>2</sub> no matter what the inputs are. This is an unverified assumption.

Further, Condition Report 24590-WTP-GCA-MGT-15-01819, dated 10-16-15, identified a lack of quality assurance requirements for scientific data, which includes many of the inputs to 24590-WTP-RPT-PT-005.

- Mechanical Data Sheet 24590-LAW-MKD-LVP-00012, Rev 15 (see page 11) relies on technical reports from off-gas emissions testing using simulants. However, there is no indication that these tests addressed the most challenging conditions per NQA-1 requirements, so the data used could be non-conservative. The relationship to DFLAW feeds is indeterminate.
- Mechanical Data Sheet 24590-LAW-MKD-LVP-00012, Rev 15 (see page 11) shows a change history for the engineering specification that has multiple changes including an unsupported statement that the changes do not affect the design margin (see page 4). Page 4 states that there was a decreased off-gas outlet design temperature, but the effect on the process margin (ability to react at least/more than 98% of the NO<sub>x</sub>) was not evaluated and no margin analysis was required. No margin analysis is available for DFLAW feeds. Reducing the catalyst temperature reduces the capacity and efficiency of the TCO.
- Project PIERS and Conditions Reports indicate multiple failures in the TCO design including an out-of-business vendor replaced with a “recovery vendor.” These reports include:

24590-WTP-CRPT-QA-08-623-C, dated 11-12-08, DOH Code Compliance, PDSA,  
24590-WTP-PIER-MGT-09-1520-HLW-TCO, dated 10-08-09, - Quality Level (HLW  
TCO has the same function as in the LAW facility)

24590-WTP-PIER-MGT-11-1265-C, dated 12-13-11, Fatigue Assessment

24590-WTP-PIER-MGT-13-0024-C, dated 12-18-12, HLW-TCO PIER – Temperature  
Margin (HLW TCO has the same function as in the LAW facility)

24590-WTP-PIER-MGT-0351-C, dated 03-12-13, Clearance of the skid not adequate for  
Operations and Maintenance

24590-WTP-PIER-MGT-13-0511-C, dated 04-30-13, Permit Non-Compliance

24590-WTP-PIER-MGT-13-0662-C, dated 06-12-13, RVP Procurement Issues

24590-WTP-PIER-MGT-13-1528-B, dated 01-07-14, New Vendor – Issues with reusing the design from a failed vendor

24590-WTP-PIER-MGT-14-1452, date 07-09-15, Commercial Grade Dedication Issues for HLW TCO (same vendor as the LAW TCO)

24590-WTP-GCA-MGT-16-00030, dated 01-08-16, TCO Functional Test Plan Not Reviewed by Operations

There is no indication in the Permit package that these PIERS/Condition Reports have been resolved effectively, and the Bechtel Corrective Actions program is suspect, due to multiple prior failures, including multiple improper closures of corrective actions. Bechtel was aware of TCO issues before signing permit change request.

- The draft LAW Design and Operability Report contains recommendations for the LAW-TCO that have not been addressed, including:

*“An analysis of the thermal loading on the TCO skid should be performed to determine whether the materials of construction can accommodate the stresses imposed by the thermal cycling. Although considered unlikely, this analysis may result in redesign of Post CD-4 equipment.”*

*“Conduct analysis to determine the maximum flow increase that can be accommodated by the electric heater to remain above the catalyst operating temperature [this affects efficiency and ability to treat organics and NOx]. A new limit on flow rate increase may result.”*

*”The viability of the current TCO maintenance approach and associated throughput are indeterminate.”*

- The Commercial Grade Dedication Audit, 15-QAD-0038, found problems with the new LAW-TCO Vendor’s commercial grade dedication. Example results (there are more) include:

*“Review of the commercial grade survey report and checklist for IONEX (24590-WTP-SSVMATL-13-007, Commercial Grade Survey Report, IONEX Research Corporation, Lafayette, Colorado, Rev. 0) in support of the low-activity waste thermal catalytic oxidizer (TCO)/reducer skid and ammonia skid identified instances in which the documented expectation was not met yet the item was marked as satisfactory. An explanation was not provided as to why the line-of inquiry (LOI) was satisfactory even though the requirements were not met.”*

*“The CGD plan for the Low-Activity Waste Catalytic Oxidizer/Reducer Skid and Ammonia Dilution Skid assembly did not document, through the technical evaluation, the critical characteristics representing those characteristics of the item that supported the ability of the host equipment to perform the required safety functions during and after a design basis accident. Additionally, the individual CGD plans for the components of the skid did not address the need for system performance to meet the safety function during and after a seismic event.”*

- A DOE-HQ review of the LAW Hazards Analysis (15-TRS-0017, August 26, 2015) found aspects of the Hazards Analysis inadequate, including inappropriate, or misclassified candidate hazard controls for the ammonia system. (Ammonia is a reagent used in the LAW-TCO).
- A draft DOE-OIG assessment of the WTP Corrective Action Program concluded (06-03-15) “it is too early to draw conclusions on the efficacy of the corrective actions taken and underway.” Therefore, changes to the designs as a result of the findings may not be

effective themselves. The IG found that DOE “did not ensure that previous Bechtel initiatives to address corrective action program implementation problems were fully implemented or sustained.”

***Ecology Response to Comment #3, Part VII, TCO/SCR Comments:***

*Calculation 24590-LAW-MVC-LVP-00004, Rev. A is a “Committed Calculation.” WTP procedure 24590-WTP-3DP-G04B-00037, Rev. 29, Exhibit A: Definitions defines the term Committed Calculations as:*

*“Committed calculations (designated with alpha revisions) may be utilized in final design documents prior to being confirmed. These calculations contain assumptions that require verification.”*

*This definition also applies to 24590-WTP-M4C-VIT-00004, Rev. C, Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP.*

*The IQRPE package makes a reference to 24590-LAW-M4C-LOP-00001, Rev. 3, including ECCN #00003 and #00009. The document 24590-LAW-M4E-LOP-00009 is the Engineering Calculation Change Notice (ECCN) referenced in the IQRPE package. 24590-LAW-M4E-LOP-00009 states that it is an ECCN to calculation 24590-LAW-M4C-LOP-00001 Rev. 3. As an ECCN to the M4C-LOP-00001 calculation (M4E-LOP-00009) it becomes the latest version. The mechanical data sheet 24590-LAW-MKD-LVP-00012, Rev. 12 correctly references 24590-LAW-M4E-LOP-00009 as it is the latest version of 24590-LAW-M4C-LOP-00001.*

*Although DFLAW was not a part of this public comment period, Ecology agrees that more information will need to be submitted before we can proceed with the permitting of the DFLAW process. Ecology also expects to receive updated mass balance documentation for the DFLAW process. When that information is submitted in support of future permit modifications, it will be made available for public review. Permit modifications to support the DFLAW process, including updated mass balance documentation, will be made in accordance with Washington Administrative Code 173-303-830. Ecology will ensure appropriate modifications are in place before final design certification and approval.*

*Document 24590-WTP-RPT-PT-02-005, rev. 7, page 3.3-16, needs to be updated to align with the design temperatures in 24590-LAW-MKD-LVP-00012, rev. 15 in which 95% conversion rate is achieved (720°F minimum to 750°F nominal).*

*The specified catalyst is provided in sufficient surface area and depth to ensure that face velocity and residence time are achieved to align with the testing performed at Catholic University’s Vitreous State Laboratory (VSL), which is the basis for source controlling the catalyst. Reference: Regulatory Off-Gas Emissions Testing on the DM1200 Melter System Using HLW and LAW Simulants, 24590-101-TSA-W000-0009-166-00001.*

*Revision to mechanical data sheet 24590-LAW-MKD-LVP-00012 page 4 revision history refers to revision 10 of the data sheet. Revision 10 adjusted the outlet offgas temperature of the source controlled Badische Anilin- und Soda-Fabrik (BASF) VOC at 300S required to be utilized by the supplier in LAW TCO design. The source control of the oxidation catalyst was mandated to align it with the testing performed at VSL (see: 24590-101-TSA-W000-0009-166-00001.). The temperature range specified for use was provided by technical representatives of BASF Corp to ensure a 95% conversion of VOCs.*

*Ongoing work with BASF has re-adjusted the target temperature of the VOC at 300S for a target temperature range of 720°F to 750°F to ensure the 95% conversion rate. While no margin analysis was performed for the revision 10 temperature adjustments, the information was provided by the catalyst supplier.*

*Data sheet 24590-LAW-MKD-LVP-00012 is now at revision 15. Catalyst data for VOC at 300S is available in document 24590-CD-POC-MBT0-00007-03-00003 Rev 00D. The temperature range adjustment in revision 10 was for VOC and not NOx catalyst.*

*The ammonia dilution system is designed to combine air and ammonia. The design basis for the ammonia dilution skid was based on testing at Catholic University, West Valley Demonstration Project, and air permitting requirements.*

*The mixed air and ammonia ratio is controlled to ensure the ratio is maintained below the flammability limit. The ammonia/air mixture is passed through the Selective Catalytic Reducer (SCR) catalyst to reduce NOx to nitrogen and water vapor. The SCR catalyst is a titanium oxide material deposited on a metal monolith, which is held in frames and inserted/removed through access doors. The Selective Catalytic Reduction (SCR) catalyst is designed to achieve a NOx reduction of 98%. The catalyst has been designed to be replaced during operations. Replacement of the catalyst is determined by measured removal efficiencies.*

*The ammonia dilution skid is located in an enclosed ventilated room prevent exposure to the facility workers. Access to the room is controlled with alarm instrumentation to minimize the potential of personnel exposure.*

*DOE performed an audit of the CGD program in 2015 that resulted in a change to the WTP program. At the end of the DOE audit, several actions were identified that resulted in the development of a new CGD program that aligns with the DOE requirements. Compensatory measures were put in place until Subject Matter Experts were identified, vendor documentation was resubmitted, and required procedures were revised. This is a DOE requirement and DOE has determined that the revised CGD program has been successfully implemented.*

*Significant progress had been made on the design and fabrication of the TCO that aligned with the design package submitted to Ecology and public for review. Some of the highlights of the progress include successful completion of the functional acceptance test of the TCO assembly. This test included full thermal cycling and operation of the TCO using prototypic heats and flow rates. The TCO met or exceeded all its functional requirements, such as temperature, flow rates, pressure drop, catalyst replacement, etc.*

*Many of the Condition Reports cited in the comment are expected to be closed in accordance with BNI procedures. The design media changes will not impact or change the overall structural integrity. The final TCO package incorporated the additional Commercial Grade Dedication requirements. Nearly all the CGD plans have been submitted and approved, however there are some items that BNI has chosen to complete in the construction field during installation, such as instrument and valve installations, etc.*

*To ensure the quality of the LAW LOP/LVP system design, Ecology conducted a thorough review of the LAW Design and Operability Review and Recommendations Report, and we believe the Permittees have adequately addressed technical issues as they relate to the TCO.*

*The Office of Inspector General review identified and documented issues that were concurrently being addressed through BNI's root cause evaluation, and the ORP October 2013 Priority 1 findings. These reviews resulted in improvements to the WTP Quality Assurance Program and*

*Corrective Action Management Plan. The Permittees will continue to identify deficiencies and develop corrective actions to address the deficiencies.*

### **LAW HEPA PREHEATER COMMENTS**

- The LAW HEPA Preheater IQRPE report continues to rely on a letter revision pipe stress calculation that is not a final design. 24590-CM-HC4-HXYG-00240-01-00010, Rev 0A refers to 24590-LAW-P6C-LOP-10016, Rev. E, *Pipe Stress Analysis for LOP System (Design Calculation)*. Letter revisions are not final design documents.
- The LAW HEPA Preheaters are upstream of the TCO/SCR, so they are exposed to untreated and lethal concentrations of NO<sub>x</sub> (many times the concentration that is immediately dangerous to life and health). See the BARD, 24590-WTP-RPT-PT-02-005, Rev. 7, Figure 1.2-3, Page 1.2-7.

Drawing 24590-CD-POA-MEE0-00003-03-00004, “Immersion Heater Flanged” identifies the heated medium as air with “no lethal substances” instead of a process toxic off-gas. See sheet 1. Sheet 3 of this drawing shows the number of commercial grade material specifications. The absence of a commercial grade dedication report in the permit package is contrary to the requirement that a final permit contain a *description of procedures, structures, or equipment used at the facility to prevent undue exposure of personnel to dangerous waste, and prevent releases to the atmosphere*. Without a commercial grade dedication report, the features needed in the heater to prevent releases to the workers cannot be verified as effective.

### ***Ecology Response to Comment #3, Part VII, LAW HEPA Preheater Comments***

*The calculation 24590-LAW-P6C-LOP-10016, Rev. E., is a committed calculation. WTP procedure 24590-WTP-3DP-G04B-0037, Rev. 29, Exhibit A: Definitions defines the term Committed Calculations: “Committed calculations (designated with alpha revision) may be utilized in final design documents prior to being confirmed. These calculations contain assumptions that require verification.”*

*WTP design of HEPA Preheaters has taken into account all the necessary guidelines and requirements from the LAW Preliminary Documented Safety Analysis (PDSA) in manufacturing the preheaters to meet their safety criteria. In addition, vendor drawings completed for BNI were correctly marked based on the definition of Lethal Service from the ASME code (Section VII, Division I) from paragraph UW-2 (Service Restrictions). BNI specified the material of construction to the vendor, so environmental factors were not important to the vendor for material selection.*

### **Comment #3, Part VIII, from Anonymous, January 12, 2016**

#### **VIII. The Certification Statements are Open to Question**

The managers of Bechtel National Inc. and DOE-Office of River Protection are required by WAC-173-303-810 to sign a certification that states:

*“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel gather the[sic] and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or persons directly responsible for gathering the information, the*

*information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”*

What standard does Ecology use for evaluating the value and truthfulness of these signatures?

***Ecology Response to Comment #3, Part VIII:***

*Ecology expects that the Permittees will submit documentation that is “true, accurate, and complete.” Determination of an individual’s professional ethics is not within our regulatory authority. However, Ecology fully expects the individuals who represent the permittees to stand behind their commitment to a “true, accurate and complete” submittal.*

*Each individual who signs the certification is responsible for the integrity of the submittal, as detailed in WAC 173-303-810(13). If during a permit application or completeness review, Ecology finds that a submittal is not “true, accurate, and complete,” Ecology will require new or additional documentation and information to fulfill the WAC requirement.*

**Comment #4, from Anonymous, January 20, 2016**

Following is a comment regarding Permit Modification 8C.2015.2D, *Changes to the Waste Treatment Plant Design*. (Comment period from December 28, 2015, to February 13, 2016.)

This permit modification is intended to allow installation of the Low Activity Waste (LAW) facility thermal catalytic oxidizer, (TCO), selective catalytic reduction unit (SCR), caustic scrubber, and HEPA heater equipment.

Installation of this equipment is not supported by the faulty and incomplete state of the WTP design. Many issues are not resolved. Many have also been inappropriately closed. In addition, DOE oversight continues to misrepresent findings at a lower level of severity than warranted. To start, please see letter 15-WTP-0141, “*Level 2 Assessment Report S-15-WED-RPPWTP-005, Low-Activity Waste Primary Offgas Process and Secondary Offgas/Vessel Vent Process Technical Issue Status Report*,” dated January 8, 2016. This report identifies numerous unresolved problems with the LAW offgas equipment, including issues that were inadequately closed, some that were only “apparently” closed (including temperature issues in the caustic scrubber), and many that are still open. There is tremendous uncertainty in the train of process operations, and therefore there is tremendous uncertainty in the ability to treat and contain dangerous waste. Four issues were closed “with concern,” five were not tracked at all, thirty-six are still open, and three only “appeared to be” resolved, without further investigation by DOE. The review for this assessment was conducted between May 1, 2015, and July 1, 2015. As a result, DOE knew of and ignored this information prior to the current permit modification request.

Another concern is that DOE did not identify the unsupported closure of issues as a formal finding – only an “opportunity for improvement.” This represents another example of the misrepresentation or “dumbing down” of findings as was flagged in a recent DOE Headquarters QA Audit. The consequences are that the issues will not have causal analyses or have a hope of genuine integrated correction. Please see EM-PA-15-14, which is attached to a headquarters memorandum dated July 1, 2015, “*Report for Quality Assurance Audit EM-PA-15-14 of Technical and Regulatory Support at the Office of River Protection.*” Other issues, including those in the non-published LAW Design and Operability Review Report, may similarly be played down in importance.

In addition, the problems are continuing:

Corrective actions have not been taken to preclude recurrence related to failures in supplier calculations. What is the condition of the design and process calculations for the LAW offgas

system equipment treatment train? One reference for this is Condition Report 24590-WTP-GCA-MGT-16-00067.

Corrective actions have not been implemented in recent ALARA design review. What is the condition for the LAW offgas equipment? Will worker exposure to chemicals and radiation be managed properly? Were the source terms adequately estimated? See Condition Report 24590-WTP-GCA-MGT-15-01983.

Leak testing of the LAW heating elements for the Thermal Catalytic Oxidizer at the mounting plate joints is “not feasible.” Why was the system designed so that the confinement ability can’t be verified? See Condition Report 24590-WTP-SE-NS-15-0255.

How many total, integrated problems are not resolved? How much faith does Ecology have in promises that the corrective actions programs and plans will fix it someday, “if you only let us install it now?” Fixes for one problem that allow a deviation often create other problems in related equipment or systems.

This permit modification is premature and WTP is nowhere ready for future installations.

***Ecology Response to Comment #4:***

*The DOE Level 2 Assessment, letter 15-WTP-0141, assessed issues that had been previously identified and were already being tracked by the project. The open issues identified in the Level 2 Assessment are detailed and resolved through BNI’s internal tracking database. For example, 24590-WTP-GCA-MGT-16-00067 tracks some of the previously identified concerns assessed in the Level 2 Assessment.*

*At this time, the Permittees have determined that the issues identified will not result in changes to the existing equipment or hardware. If modifications to the WTP Permit design or documentation are required as a result of corrective actions, changes would be made through the permitting process required under the Washington Administrative Code 173-303-830. Ecology will ensure appropriate modifications are in place prior to final design certification and approval.*

*The LAW LOP and LVP System is the subject of the current modification. To ensure the quality of the LAW LOP/LVP design, Ecology reviewed the draft Design and Operability Review and Recommendations Report prior to the public comment period, and had areas of concerns.*

*As stated in the Statement of Basis for this draft permit modification, Ecology requested that the Permittees provide sufficient information to address those concerns before we could make a final decision regarding this permit modification.*

*The final Design and Operability Review and Recommendations Report was released on January 29, 2016. Ecology thoroughly reviewed the final report to determine if it identified additional concerns that were not included in the draft report.*

*Design and operability vulnerabilities were identified for the LAW LOP/LVP system, which could impact the equipment included in this modification. Ecology held extensive discussions with the Permittees regarding the identified vulnerabilities, and we believe our concerns have been addressed adequately. The following sections provide details about the design packages included in this permit modification.*

*Ecology will continue to engage with the Permittees regarding the vulnerabilities identified in the D&O report, as they relate to other systems within the LAW Facility, to ensure that the vulnerabilities are being addressed appropriately and corrective actions, if needed, are being implemented.*

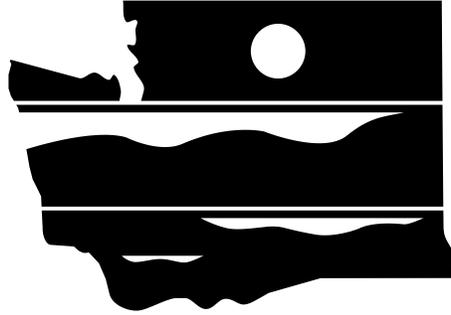
*The recent ALARA design review referenced in condition report 24590-WTP-GCA-MGT-15-01983 was conducted on systems not related to the LAW offgas equipment included in this permit modification. Low activity waste contains low levels of radionuclides, which would be treated during vitrification. The resulting offgas from the vitrification process would present minimal radiological exposure to workers. Worker exposure to chemical release from the offgas train is mitigated by operating the system under negative pressure.*

*The TCO underwent design changes prior to fabrication. The TCO was pressure tested twice after fabrication. One pressure test was to demonstrate compliance with ASME Code for a Section VIII vessel, which is required to stamp the TCO heaters with the ASME Code. The second test was performed by the fabricator to comply with NQA-1 standards. In addition, the LAW offgas system will operate under negative pressure which is expected to mitigate the release of offgas into the facility.*

## **APPENDIX A: COPIES OF ALL PUBLIC NOTICES**

Public notices for this comment period:

1. Statement of Basis.
2. Public notice (focus sheet).
3. Classified advertisement in the *Tri-City Herald*.
4. Notice sent to the Hanford-Info email list.



DEPARTMENT OF  
**ECOLOGY**  
State of Washington

**STATEMENT OF BASIS**

**Proposed Permit Modification of the  
*Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous  
Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of  
Dangerous Waste,*  
Part III, Operating Unit Group 10, Waste Treatment and Immobilization Plant,  
WA7890008967**

December 2015

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## STATEMENT OF BASIS

**Proposed Permit Modification of the  
*Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous  
Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of  
Dangerous Waste,*  
Part III, Operating Unit Group 10, Waste Treatment and Immobilization Plant,  
WA7890008967**

### Permittees

United States Department of Energy  
Office of River Protection  
PO Box 450  
Richland, Washington 99352

Bechtel National, Inc.  
2435 Stevens Center Place  
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The Washington State Department of Ecology (Ecology) developed this Statement of Basis to fulfill the requirements of Washington Administrative Code [\(WAC\) 173-303-840\(2\)\(f\)\(iv\)](#).

The Statement of Basis provides information on Ecology's decision to modify the *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, Part III, Operating Unit Group 10, Waste Treatment and Immobilization Plant (WTP), hereafter called the "WTP Permit."

This modification includes supporting technical information and engineering drawings for construction on the regulated portions of the WTP:

- Pretreatment Facility (PTF)
- Low-Activity Waste (LAW) Facility
- High-Level Waste (HLW) Facility
- Laboratory (LAB) Facility
- Balance of Facilities (BOF)

This modification also incorporates format changes to the WTP Permit appendices and changes to supporting information. Ecology chose to prepare a Statement of Basis as described in [WAC 173-303-840\(2\)\(f\)\(iv\)](#), rather than a Fact Sheet.

We prepared a Statement of Basis for previous major WTP Permit modifications. This process will be followed for all permit modifications that incorporate similar design package information and other changes to the WTP Permit Conditions.

This Statement of Basis is divided into four sections:

- 1.0 Hanford Facility Resource Conservation and Recovery Act Permit (Site-wide Permit).
- 2.0 The WTP Permitting Process.
- 3.0 Procedures for Reaching a Final Decision on the Draft WTP Permit Modification.
- 4.0 Proposed Modifications to the WTP Permit.

Also included at the end of the Statement of Basis are tables, provided by the Permittees, listing the design documents and drawings they submitted for incorporation into the WTP Permit.

## **1.0 HANFORD FACILITY RESOURCE CONSERVATION AND RECOVERY ACT PERMIT (SITE-WIDE PERMIT)**

Ecology first issued the Site-wide Permit in 1994. The Site-wide Permit provides standard and general facility conditions, as well as unit-specific conditions for the operation, closure, and post-closure care of mixed and dangerous waste treatment, storage, and disposal (TSD) units at Hanford. Approximately 40 TSD units are operating or closing under Resource Conservation and Recovery Act final status standards.

Conditions of the Site-wide Permit are presented in six parts:

- Part I Standard Conditions.
- Part II General Facility Conditions.
- Part III Unit-Specific Conditions for Final Status Operating Units.
- Part IV Corrective Action for Past Practice Units.
- Part V Unit-Specific Conditions for Units Undergoing Closure.
- Part VI Unit-Specific Conditions for Units in Post-Closure.

The WTP TSD Unit was added to Part III of the Site-wide Permit on September 25, 2002. The WTP Permit portion was effective on October 25, 2002. The WTP TSD Unit is currently being constructed under final permit status standards.

The Washington State Dangerous Waste Regulations in [WAC 173-303-830](#) describe the types of changes or modifications that may be made to a Dangerous Waste Permit issued by Ecology.

The WTP Permit is modified as needed, typically one or more times a year, to incorporate Class 1, <sup>1</sup>1, 2, and 3 modifications; Agency-Initiated modifications; and minor changes in grammar, consistency, and presentation.

## **2.0 THE WTP PERMITTING PROCESS**

We are using a phased (or stepped) approach to permit the WTP TSD Unit. The first phase was completed on September 25, 2002, with issuance of a final Dangerous Waste Permit allowing construction of the LAW, PTF, HLW, LAB, and BOF facilities to start.

A WTP Interim Compliance Schedule for the United States Department of Energy provides Ecology additional detailed information addressing the submittal of design documents necessary to support construction of the rest of the WTP TSD Unit, and its eventual operation.

This second phase of permitting is included in the compliance schedule, and requires the Permittees to submit design and other information for Ecology approval before regulated portions of the WTP TSD Unit are constructed.

The third phase of permitting is implementation of the last portion of the compliance schedule. This requires updating portions of the Dangerous Waste Permit Application and then modifying the WTP Permit prior to facility start-up operations. These portions (for example, Contingency Plan, Closure Plan, and Training Plan) of the WTP Permit are operational in nature and cannot be completed before the design is nearly complete.

When the three phases of permitting are completed, the WTP TSD Unit will comply with all the applicable requirements of [WAC 173-303](#). Then, after receiving written permission from Ecology, the Permittees can begin treatment and storage of dangerous and mixed waste at the WTP.

The design submittals (second permitting phase) were structured to allow the Permittees to provide design information in roughly the same order as the WTP facilities are constructed.

The design packages start at the lowest level of the facilities (below-grade levels) and are submitted for regulated areas of each level before construction begins. This process was adjusted for some design packages. When the facility process systems are installed on more than one level, the design packages will address the associated components for each level. This prevents confusion caused by one process system description being segmented into multiple design packages.

The WTP Permit organizes design packages into three general groups by the type of regulated equipment:

1. Primary containment (for example, tanks, miscellaneous units [evaporators and melters], and containment buildings).
2. Secondary containment.
3. Other associated regulated equipment (for example, ancillary equipment, equipment associated with miscellaneous units, and instrumentation).

Using tank systems as an example, secondary containment packages include details of the design of secondary containment that must be in place in regulated areas when the floors and walls are built for that level of each facility (for example, the floor slope, and sump locations).

The installation of tanks and other large equipment usually follows construction of the floors and walls. Therefore, a tank package on that level will be included in the WTP Permit before installation. The tank package would contain, for example, structural details for those tanks or miscellaneous units showing nozzle locations, unit volumes, and tank shell thickness.

The last equipment usually installed on a level for a tank system is the ancillary equipment (for example, piping, pumps, process instrumentation, and electrical equipment). Therefore, the ancillary equipment package provides details for the equipment on that level that will be included in the WTP Permit before installation. Information in the package would include, for example, materials of construction, and pump types and their operating limits.

Because each WTP facility consists of multiple levels, many design packages are required. Of the estimated 180 design packages, approximately 40 remain to be incorporated in the WTP Permit.

The primary containment, secondary containment, and the other associated regulated equipment design packages for different levels require repetitive information submittals in each package. Using tank systems as an example, most tanks will use the same construction specifications.

The WTP Permit allows the Permittees to reference the previously submitted design information, so some design packages consist mostly of references to information already provided.

### **3.0 PROCEDURES FOR REACHING A FINAL DECISION ON THE DRAFT WTP PERMIT MODIFICATION**

The Washington State Hazardous Waste Management Act ([Chapter 70.105, Revised Code of Washington](#)) and the rules declared in [WAC Chapter 173-303](#) regulate the management of dangerous waste in Washington State. [WAC 173-303-800](#) requires facilities that treat, store, and/or dispose of dangerous waste to obtain a permit for these activities.

Regulatory requirements for public notice and involvement on permit modifications are described in [WAC 173-303-840](#)(3) and (4). As required by [WAC 173-303-840](#)(3)(d), draft modifications to the WTP Permit will have at least a 45-day public comment period. The public comment period for this proposed permit modification begins on December 28, 2015, and ends on February 13, 2016.

Comments must be post-marked, received by e-mail, or hand-delivered no later than close of business (5:00 p.m. PST) February 13, 2016. Direct all written comments to:

Dieter Bohrmann  
Washington State Department of Ecology  
3100 Port of Benton Blvd.  
Richland, Washington 99354  
E-mail address: [hanford@ecy.wa.gov](mailto:hanford@ecy.wa.gov)

In accordance with [WAC 173-303-840](#)(10)(c), when a permit is modified, only the conditions subject to modification are open for comment. All other aspects of the existing Permit remain in effect for the duration of the modification.

Ecology will consider and respond to all written comments on this permit modification submitted by the deadline. Ecology will then make a final permit decision, which will become effective 30 days after Ecology provides notice of the decision to the Permittees and to all who commented. If the final decision includes substantial changes to the WTP Permit because of public comment, we will initiate a new public comment period.

Ecology will provide a Response to Comments document and a notification of the final permit decision to the Permittees and all others who commented. The final permit decision may be appealed within 30 days after issuance of that decision.

Copies of the WTP Permit, including the proposed permit modifications, are available for review at the Hanford Public Information Repositories. For additional information, call the Hanford Cleanup Hotline toll-free at 800-321-2008 or email [hanford@ecy.wa.gov](mailto:hanford@ecy.wa.gov).

## **Hanford Public Information Repositories**

### **Richland**

United States Department of Ecology  
Nuclear Waste Program Resource Center  
3100 Port of Benton Boulevard  
Richland, Washington 99354  
Contact: Valarie Peery (509) 372-7950

United States Department of Energy  
Administrative Record  
2440 Stevens Drive  
Richland, Washington 99354  
Contact: Heather Childers (509) 376-2530

United States Department of Energy  
Reading Room  
2770 Crimson Way, Room 101L  
Richland, Washington 99354  
Contact: Janice Parthree (509) 375-3308

### **Portland**

Portland State University  
Branford Price Millar Library  
1875 Southwest Park Avenue  
Portland, Oregon 97207  
Contact: Claudia Weston (503) 725-4542

### **Seattle**

University of Washington  
Suzzallo Library  
PO Box 352900  
Seattle, Washington 98195  
Contact: Hilary Reinert (206) 543-5597

### **Spokane**

Gonzaga University  
Foley Center  
502 East Boone Avenue  
Spokane, Washington 99258  
Contact: John Spencer (509) 313-6110

This Statement of Basis and Public Notice for the proposed permit modification is also available online at <http://www.ecy.wa.gov/programs/nwp/commentperiods.htm>. If special accommodations are needed for public comment, contact Dieter Bohrmann, Ecology, at 800-321-2008.

#### 4.0 PROPOSED MODIFICATIONS TO THE WTP PERMIT

This proposed permit modification contains the following packages. New or revised documents submitted with the packages are listed below. See [Tables 1](#) through [3](#) at the end of this document for the entire list of package documents.

In late August 2015, Ecology received information about a draft LAW Design and Operability Review Report that was released to the media. We have read the report, and identified portions of the report that directly relate to the equipment that is included in design packages for this proposed modification. Ecology has requested that the Permittees provide sufficient detail to address our concerns on the issues identified. We will thoroughly review and evaluate the information they provide prior to making a final decision regarding this proposed modification.

##### ***Design Package No. LAW-026A, Rev. 0, for Miscellaneous Unit Subsystems for LAW Facility LVP System (HEPA Preheaters LVP-HTR-00001A/B & -00003A/B)***

The LAW-026A permit design package addresses the design and installation of the high-efficiency particulate air (HEPA) preheaters, which are part of the secondary offgas/vessel vent process (LVP) system at the 48 ft. elevation.

In the LVP system, melter offgas is combined with the vessel vent offgas which is heated in the HEPA preheaters to raise the offgas temperature above the dew point. The heated offgas is then dry enough to pass through HEPA filters, which remove particulates, before the offgas passes through the rest of the LVP system.

The LAW-026A design package was submitted for a 45-day public comment period from September 2 through October 20, 2014. As a result of public comments received during the public comment period, technical issues were raised. Ecology withdrew this design package pending resolution of the unresolved issues and resulting corrective actions. The Permittee has addressed the outstanding technical issues and has revised and resubmitted the LAW-026A permit design package for a second public review period.

Design package LAW-026A, Rev. 1 consists of:

- An assessment report signed by an Independent, Qualified, Registered, Professional Engineer (IQRPE) certifying the LVP HEPA Preheater Design.
- Vendor mechanical drawing of the LVP HEPA Preheaters.
- Vendor mechanical data sheet for the LVP HEPA Preheaters.
- Corrosion evaluation for the LVP HEPA Preheaters.

The complete list of documents included in the package is indicated by a “Y” in the “Included Column” on [Table 1](#).

##### ***Design Package No. LAW-025, Rev. 0, for Miscellaneous Unit Subsystems for LAW Facility LVP System (Thermal Catalytic Oxidizer, Selective Catalytic Reducer, Electric Heater, and Heat Exchanger located on LVP-SKID-00002)***

The LAW-025 permit design package addresses design and installation of the thermal catalytic oxidizer, selective catalytic reducer, electric heater, and heat exchanger equipment which are part

of the LAW LVP system. The equipment components are assembled into a single unit called a skid, which is located on the 48 ft. elevation of the LAW facility.

In the LVP system, once the offgas passes through the HEPA filters, the filtered offgas is passed through activated carbon adsorption units which remove mercury, iodine, and acid gasses from the offgas stream, before being directed into the thermal catalytic oxidizer skid.

The catalytic oxidizer skid is made up of a heat exchanger, electric heater, thermal catalytic oxidizer, and selective catalytic reducer components. The catalytic oxidizer skid removes volatile organic compounds, carbon monoxide, and nitrogen oxides from the offgas stream. The offgas first passes through the heat exchanger to raise the temperature of the offgas. The electric heater is used next to supplement the heat exchanger during start-up, and when the system is operating with low nitrogen oxide concentrations. The heated offgas then passes through the thermal catalytic oxidizer to convert volatile organic compounds and carbon monoxide into carbon dioxide and water vapor. The selective catalytic reducer converts oxides of nitrogen into nitrogen and water using ammonia. This final reaction significantly increases the temperature of the offgas, so it is passed again through the heat exchanger, this time to cool the offgas, before it moves through the rest of the LVP system.

Design package LAW-025, Rev. 0, includes:

- An assessment report signed by an IQRPE certifying that the thermal catalytic oxidizer/selective catalytic reducer is adequately designed and will not collapse, rupture, or fail as provided in [WAC-173-303-640\(2\)\(c\)](#).
- General Arrangement Plan.
- Piping and Instrumentation Diagram.
- Mechanical drawings for the thermal catalytic oxidizer/reducer with heat exchanger and electric heater.
- Engineering specification for the thermal catalytic oxidizers/reducer with heat exchanger and electric heater.
- Engineering specification for pressure vessel design and fabrication.
- Mechanical data sheet for the LAW thermal catalytic oxidizer/selective catalytic reducer (with heat exchanger and electric heater).
- Corrosion evaluations for the:
  - Catalytic oxidizer heat recovery exchanger.
  - Catalytic oxidizer electric heater.
  - Thermal catalytic oxidizer.
  - NOx selective catalytic reducer.

The complete list of documents included in the package is indicated by a “Y” in the “Included Column” on [Table 2](#).

**Design Package No. LAW-028, Rev. 0, for the LAW Facility LVP System  
Miscellaneous Unit (LAW Melter Offgas Caustic Scrubber)**

The LAW-028 permit design package addresses the design and installation of the caustic scrubber which is part of the LAW LVP system, located at the 48 ft. elevation of the LAW facility.

In the LVP system, once melter offgas has passed through the thermal oxidizer skid, it is directed through the caustic scrubber, which removes residual acid gasses (primarily sulfur oxides and carbon dioxide) and provides further cooling of the offgas. Liquid effluent from the caustic scrubber is recirculated through a caustic collection tank. The treated offgas is then discharged to the atmosphere through the LAW stacks. Exhausters provide the motive force for the offgas.

Design Package LAW-028, Rev. 0 includes:

- An assessment report signed by an IQRPE certifying the LAW melter offgas caustic scrubber design.
- Mechanical data sheet for the LAW melter offgas caustic scrubber.
- Vendor mechanical drawing for the LAW melter offgas caustic scrubber.
- Corrosion evaluation for the LAW melter offgas caustic scrubber.
- Engineering specification for the LAW melter offgas caustic scrubber.
- Engineering specification for Positive Material Identification for Shop Fabrication.

The complete list of documents included in the package is indicated by a “Y” in the “Included Column” on [Table 3](#).

**4.1 Incorporation of Class 1 and Class <sup>1</sup>1 Permit Modifications (PCNs) and Permit Equivalency Notices (PENs)**

Previously approved Class 1 and Class <sup>1</sup>1 PCNs and PENs are incorporated through the Quarterly Modifications. There will be no PCNs or PENs incorporated through this proposed modification.

**4.2 Supplemental Design Information**

[Tables 1](#) through [3](#) list the design information included in this proposed permit modification and the proposed location in the WTP Permit. At issuance of the final WTP Permit, Ecology will specify where each drawing or report resides in the WTP Permit.

Paper copies of the page changes to the WTP Permit that result from this modification will be placed in the Administrative Record.

The letter issuing the final WTP Permit decision to the Permittees and Hanford contractors will include the current WTP Permit with the modifications on a DVD.

**4.3 Identifying Changes in this Proposed Permit Modification**

As the WTP TSD Unit is constructed, Ecology will modify the WTP Permit for many reasons, including to clarify text, add new conditions, delete existing conditions, correct errors, or add information. To communicate the changes, proposed permit modifications will include page changes showing all significant proposed changes to the WTP Permit. The text to be deleted will

be struck-out with a single red line, and the new text will be in red and underlined. Only the text being changed in the current modification will be indicated by redlines and strikeouts.

Newly added documents and drawings are provided for review in this proposed permit modification. New document and drawing numbers and titles are shown in redline/strikeout text in the affected appendix drawing lists.

When a WTP Permit modification is issued, “clean” pages incorporating permit modifications will be issued to the Permittees and placed in the Administrative Record. All redlines and strikeouts will be removed. Documents and drawings listed in the appendices will not be redlined and will be incorporated by reference only.

Ecology publication number 07-05-006, *Responsiveness Summary* (September 27, 2007), explains the reason for replacing permit version documents with source documents to which the WTP is constructed. Source documents are in a state of constant revision as design details are finalized and additional information is added to provide clarity and to correct typographical errors.

The Permittees use Document Change Notices to track changes not yet incorporated into source documents. In some cases, Document Change Notices are issued at the time of Ecology’s review. These are not provided for public comment, but will appear in the next revision of the WTP Permit for review. Source documents have been replacing permit version documents since September 2007.

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**Table 1 – Design Information Submitted by Permittees**

***Design Package No. LAW-026A, Rev. 0  
for the LAW Facility LVP System Miscellaneous Unit  
(HEPA Preheaters LVP-HTR-00001A/B & 00003A/B)***

**For Incorporation into the WTP Permit**

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<b>Engineering Document Title</b>	<b>Document Number</b>	<b>Revision</b>	<b>Permit Conditions</b>	<b>Included</b>	<b>Remarks</b>
IQRPE Independent Assessment Report	24590-CM-HC4-HXYG-00240-02-00010	00A	III.10.H.5.c.i	Y	Incorporate IQRPE report into Appendix 9.11
<b>Permit Drawings</b>					
General Arrangement Plan	24590-LAW-P1-P01T-00005	6	III.10.H.5.c.ii	N	In Appendix 9.4, Revision 6 included in LAW-025
Drawing Change Notice for 24590-LAW-P1-P01T-00005	24590-LAW-P1N-P01T-00070			N	Provided to Ecology in CCN 261726
Drawing Change Notice for 24590-LAW-P1-P01T-00005	24590-LAW-P1N-P01T-00073			N	Provided to Ecology in CCN 261729
Process Flow Diagram	24590-LAW-M5-V17T-00010	4	III.10.H.5.c.ii	N	In Appendix 9.1
Drawing Change Notice for 24590-LAW-M5-V17T-00010	24590-LAW-M5N-V17T-00030			N	Provided to Ecology in CCN 261722
Piping & Instrumentation Diagram	24590-LAW-M6-LVP-00001002	0	III.10.H.5.c.ii	N	In Appendix 9.2
Drawing Change Notice for 24590-LAW-M6-LVP-00002002	24590-LAW-M6N-LVP-00130			N	Provided to Ecology in CCN 276881
<b>Mechanical Drawing</b>					
Vendor – Mechanical Drawing for the LAW HEPA Filter Preheater	24590-CD-POA-MEE0-00003-03-00004 24590-CD-POA-MEE0-00003-03-00005	00I 00J	III.10.H.5.c.ii III.10.H.5.c.vi	Y	For incorporation into Appendix 9.6

Engineering Document Title	Document Number	Revision	Permit Conditions	Included	Remarks
<b>Mechanical Data Sheets</b>					
Mechanical Systems Data Sheet – LVP Off-Gas HEPA Pre-heaters	24590-LAW-MED-LVP-00006	1	III.10.H.5.c.ii	Y	For incorporation in Appendix 9.6
<b>Engineering Specifications</b>					
Pressure Vessel Design and Fabrication	24590-WTP-3PS-MV00-T0001	5	III.10.H.5.c.ii III.10.H.5.c.iii	N	In Appendix 7.7 (In LAW-025)
Seismic Qualification Criteria for Pressure Vessels	24590-WTP-3PS-MV00-T0002	3	III.10.H.5.c.ii III.10.H.5.c.iii	N	In Appendix 7.7
Positive Material Identification (PMI) for Shop Fabrication	24590-WTP-3PS-G000-T0002	9		N	In Appendix 7.7
Secondary Containment Design	24590-WTP-PER-CSA-02-001	10	III.10.H.5.c.ii III.10.H.5.c.iii	N	In Appendix 7.5
Underground Pipe Protection	Not applicable	-	III.10.H.5.c.iv	N/A	There are no underground pipes in the LAW facility El. 3 ft. and above
Corrosion Evaluation – HEPA Filter Preheater	24590-LAW-N1D-LVP-00009	2	III.10.H.5.c.iii III.10.H.5.c.v	Y	Incorporate in Appendix 9.9
LAW Vitrification Offgas System Bypass Analysis	24590-LAW-PER-PR-03-001	2	III.10.H.5.c.ix	N	In Appendix 9.18
Installation for Tank Systems and Miscellaneous Treatment Unit Systems	24590-WTP-PER-CON-02-001	6	III.10.H.5.c.x	N	In Appendix 7.12

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<b>Engineering Document Title</b>	<b>Document Number</b>	<b>Revision</b>	<b>Permit Condition</b>	<b>Included</b>	<b>Remarks</b>
Structural Support Calculations for Off Spec, Non-Standard or Field Fabricated Miscellaneous Treatment Subsystems	Not Applicable - See Remarks	-	III.10.H.5.c.iii	N	There are no Off Spec, Non-Standard, or Field Fabricated Miscellaneous Unit Subsystems in the LAW Facility (Preheaters are vendor fabricated.)
System Description for LOP and LVP: LAW Melter Offgas	24590-LAW-3YD-LOP-00001	3	III.10.H.5.c.vii	N	In Administrative Record (CCN 261065)
System Description Change Notice against the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LFP) Systems	24590-LAW-3YN-LOP-00011	N/A	III.10.H.5.c.vii	N	Provided to Ecology in CCN 233560
	24590-LAW-3YN-LOP-00012				Provided to Ecology in CCN 241650
	24590-LAW-3YN-LOP-00013				Provided to Ecology in CCN 241672
	24590-LAW-3YN-LOP-00015				Provided to Ecology in CCN 261722
<b>Mass and Energy Balance</b>					
Flowsheet Bases, Assumptions, and Requirements	24590-WTP-RPT-PT-02-005	7	III.10.H.5.c.viii	N	In Administrative Record (CCN 277127)
2010 WTP Material Balance and Steady State Flowsheet Assessment, Deliverable 2.7	24590-WTP-RPT-PET-10-022	0			In Administrative Record (CCN 241137)
Steady State (AES) Model Run Report for 2010 Material Balance and Process Flowsheet Analysis Assessment Report	24590-WTP-MRR-PET-10-010	0			In Administrative Record (241137)
Control of Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems	24590-WTP-PER-PR-03-002	3	III.10.H.5.c.xi	N	In Administrative Record (CCN 161097)
Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems	LAW Miscellaneous Treatment Unit Hydrogen Accumulation Document for the DWP Administrative Record (CCN 280210)		III.10.H.5.c.xii	N	In Administrative Record (CCN 277127)

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**Table 2– Design Information Submitted by Permittees**

***Design Package No. LAW-025, Rev. 0  
for Miscellaneous Unit for LAW Facility LVP System  
(Thermal Catalytic Oxidizer, Selective Catalytic Reducer, Electric Heater, and Heat Exchanger Skid)***

**For Incorporation into the WTP Permit**

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<b>Engineering Document Title</b>	<b>Document Number</b>	<b>Revision</b>	<b>Permit Conditions</b>	<b>Included</b>	<b>Remarks</b>
IQRPE Independent Assessment Report	24590-CM-HC4-HXYG-00240-02-00012	00A	III.10.H.5.c.i	Y	Incorporate into Appendix 9.11
<b>Permit Drawings</b>					
LAW Vitrification Building General Arrangement Plan at El. 48 ft – 0 in.	24590-LAW-P1-P01T-00005	6	III.10.H.5.c.ii	Y	Incorporate into Appendix 9.4
Process Flow Diagram – LAW Vitrification Secondary Offgas Treatment (System LVP)	24590-LAW-M5-V17T-00011	5	III.10.H.5.c.ii	N	In Appendix 9.1
PFD Drawing Change Notices	24590-LAW-M5N-V17T-00012		III.10.H.5.c.ii	N	In Appendix 9.1
	24590-LAW-M5N-V17T-00019				
	24590-LAW-M5N-V17T-00023				
	24590-LAW-M5N-V17T-00029				
Piping & Instrumentation Diagram  P&ID – LAW – LAW Secondary Offgas/Vessel Vent Process System SCO/SCR Skid	24590-LAW-M6-LVP-00005002	3	III.10.H.5.c.ii	Y	Incorporate into Appendix 9.2
<b>Mechanical Drawing</b>					
Vendor – LAW Thermal Catalytic Oxidizer – TCO General Arrangement	24590-CD-POC-MBT0-00007-01-00353, Sheet 1 of 4	00E	III.10.H.5.c.ii III.10.H.5.c.vi	Y	Incorporate into Appendix 9.6
	24590-CD-POC-MBT0-00007-01-00353, Sheet 2 of 4	00E			

Engineering Document Title	Document Number	Revision	Permit Conditions	Included	Remarks
	24590-CD-POC-MBT0-00007-01-00353, Sheet 3 of 4	00E			
	24590-CD-POC-MBT0-00007-01-00353, Sheet 4 of 4	00E			
<b>Mechanical Data Sheet and Other Permit Documentation</b>					
Mechanical Data Sheet – LAW Catalytic Oxidizer/Reducer	24590-LAW-MKD-LVP-00012	15	III.10.H.5.c.ii III.10.H.5.c.iii	Y	Incorporate into Appendix 9.6
Secondary Containment Design	24590-WTP-PER-CSA-02-001	10	III.10.H.5.c.ii III.10.H.5.c.iii	N	In Appendix 7.5
Underground Pipe Protection	Not applicable	-	III.10.H.5.c.iv	N	There are no underground pipes in the LAW facility El. 3 ft and above
<b>Engineering Specifications</b>					
Engineering Specification for LAW Thermal Catalytic Oxidizers/Reducers (with Heat Exchanger and Electric Heater)	24590-LAW-3PS-MBTV-T0001	5	III.10.H.5.c.ii III.10.H.5.c.iii	Y	Incorporate into Appendix 9.7
SDDR for code year reference for ASME Section VIII B & PVC listed in Engineering Specification for LAW TCO/SCR	24590-WTP-SDDR-MS-15-00017		III.10.H.5.c.ii III.10.H.5.c.iii	N	Provided to Ecology in CCN 275838
SDDR for thermowell testing for the LAW TCO/SCR	24590-WTP-SDDR-MS-15-00030		III.10.H.5.c.ii III.10.H.5.c.iii	N	Provided to Ecology in CCN 275847
Pressure Vessel Design and Fabrication	24590-WTP-3PS-MV00-T0001	5	III.10.H.5.c.ii III.10.H.5.c.iii	Y	Incorporate into Appendix 7.7
Seismic Qualification Criteria for Pressure Vessels	24590-WTP-3PS-MV00-T0002	3	III.10.H.5.c.ii III.10.H.5.c.iii	N	In Appendix 7.7
Positive Material Identification (PMI) for Shop Fabrication	24590-WTP-3PS-G000-T0002	9		N	In Appendix 7.7

Engineering Document Title	Document Number	Revision	Permit Conditions	Included	Remarks
<b>Corrosion Evaluations and other Permit Documentation</b>					
LVP-HX-00001 – Catalytic Oxidizer Heat Recovery Exchanger	24590-LAW-N1D-LVP-00005	3	III.10.H.5.c.v	Y	Incorporate into Appendix 9.9
LVP-HTR-00002 – Catalytic Oxidizer Electric Heater	24590-LAW-N1D-LVP-00006	3	III.10.H.5.c.v	Y	Incorporate into Appendix 9.9
LVP-SCO-00001 – Thermal Catalytic Oxidizer	24590-LAW-N1D-LVP-00007	4	III.10.H.5.c.v	Y	Incorporate into Appendix 9.9
LVP-SCR-00001 – NOx Selective Catalytic Oxidizer	24590-LAW-N1D-LVP-00008	3	III.10.H.5.c.v	Y	Incorporate in Appendix 9.9
LAW Vitrification Offgas System Bypass Analysis	24590-LAW-PER-PR-03-001	2	III.10.H.5.c.ix	N	In Appendix 9.18
Installation for Tank Systems and Miscellaneous Treatment Unit Systems	24590-WTP-PER-CON-02-001	6	III.10.H.5.c.x	N	In Appendix 7.12

**For Incorporation into the Administrative Record**

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Engineering Document Title	Document Number	Revision	Permit Condition	Included	Remarks
Structural Support Calculations for Off Spec, Non-Standard or Field Fabricated Miscellaneous Treatment Subsystems	Not Applicable - See Remarks	-	III.10.H.5.c.iii	N	There are no Off Spec, Non-Standard, or Field Fabricated Miscellaneous Unit Subsystems in the LAW Facility
System Description for LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems	24590-LAW-3YD-LOP-00001	3	III.10.H.5.c.vii	N	In Administrative Record
System Description Change Notice against the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LFP) Systems	24590-LAW-3YN-LOP-00011	N/A	III.10.H.5.c.vii	N	Provided to Ecology in CCN 233560
	24590-LAW-3YN-LOP-00012				Provided to Ecology in CCN 241650
	24590-LAW-3YN-LOP-00013				Provided to Ecology in CCN 241672
	24590-LAW-3YN-LOP-00015				Provided to Ecology in CCN 261722
<b>Mass and Energy Balance</b>					
Flowsheet Bases, Assumptions, and Requirements	24590-WTP-RPT-PT-02-005	7	III.10.H.5.c.viii	Y	Incorporate into Administrative Record
2010 WTP Material Balance and Steady State Flowsheet Assessment, Deliverable 2.7	24590-WTP-RPT-PET-10-022	0		N	In Administrative Record (CCN 241137)
Steady State (AES) Model Run Report for 2010 Material Balance and Process Flowsheet Analysis Assessment Report	24590-WTP-MRR-PET-10-010	0		N	In Administrative Record (CCN 241137)
Control of Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems	24590-WTP-PER-PR-03-002	3	III.10.H.5.c.xi	N	In Administrative Record (CCN 161097)
Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems	LAW Miscellaneous Treatment Unit Hydrogen Accumulation Document for the DWP Administrative Record (CCN 280210)		III.10.H.5.c.xii	Y	Incorporate into Administrative Record

**Table 3– Design Information Submitted by Permittees**

***Design Package No. LAW-028, Rev. 0  
for the LAW Facility LVP System Miscellaneous Unit  
(LAW Melter Offgas Caustic Scrubber)***

**For Incorporation into the WTP Permit**

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<b>Engineering Document Title</b>	<b>Document Number</b>	<b>Revision</b>	<b>Permit Conditions</b>	<b>Included</b>	<b>Remarks</b>
IQRPE Independent Assessment Report	24590-CM-HC4-HXYG-00240-02-00013	00A	III.10.H.5.c.i	Y	Incorporate IQRPE report into Appendix 9.11
<b>Permit Drawings</b>					
General Arrangement Plan at El. 48 ft.	24590-LAW-P1-P01T-00005	6	III.10.H.5.c.ii	N	In Appendix 9.4, Revision 5 included in LAW-025
Process Flow Diagram – LAW Vitrification Secondary Offgas Treatment (System LVP)	24590-LAW-M5-V17T-00011	5	III.10.H.5.c.ii	N	In Appendix 9.1
PFD Drawing Change Notices	24590-LAW-M5N-V17T-00012		III.10.H.5.c.ii		In Appendix 9.1
	24590-LAW-M5N-V17T-00019				
	24590-LAW-M5N-V17T-00023				
	24590-LAW-M5N-V17T-00029				
Piping & Instrumentation Diagram	24590-LAW-M6-LVP-00002002	0	III.10.H.5.c.ii	N	In Appendix 9.2
Drawing Change Notice for 24590-LAW-M6-LVP-00002002	24590-LAW-M6N-LVP-00092		III.10.H.5.c.ii	N	Provided to Ecology in CCN 254078
<b>Mechanical Drawing</b>					
Vendor – Mechanical Drawing for the LAW Melter Offgas Caustic Scrubber	24590-QL-POA-MKAS-00003-04-00050	00E	III.10.H.5.c.ii	Y	Incorporate into Appendix 9.6
	24590-QL-POA-MKAS-00003-04-00051	00E	III.10.H.5.c.vi		
	24590-QL-POA-MKAS-00003-04-00052	00E			

Engineering Document Title	Document Number	Revision	Permit Conditions	Included	Remarks
<b>Mechanical Data Sheet and Other Permit Documentation</b>					
Mechanical Data Sheet for the LAW Melter Offgas Caustic Scrubber	24590-LAW-MKD-LVP-00011	6	III.10.H.5.c.ii III.10.H.5.c.vi	Y	Incorporate into Appendix 9.6
<b>Corrosion Evaluations and other Permit Documentation</b>					
LVP-SCB-00001 – Corrosion Evaluation LAW Melter Offgas Caustic Scrubbers	24590-LAW-N1D-LVP-00001	7	III.10.H.5.c.iii III.10.H.5.c.v	Y	Incorporate into Appendix 9.9
<b>Engineering Specifications</b>					
Engineering Specification for LAW Melter Offgas Caustic Scrubber	24590-LAW-3PS-MKAS-T0001	2	III.10.H.5.c.ii III.10.H.5.c.iii III.10.H.5.c.vi	Y	Incorporate into Appendix 9.7
Technical Change Notice (TCN) to Engineering Specification for LAW Melter Offgas Caustic Scrubber	24590-QL-MRA-MKAS-00003-T0009			N	Provided to Ecology in CCN 267882
Technical Change Notice (TCN) to Engineering Specification for LAW Melter Offgas Caustic Scrubber	24590-QL-MRA-MKAS-00003-T0010			N	Provided to Ecology in CCN 267882
Technical Change Notice (TCN) to Engineering Specification for LAW Melter Offgas Caustic Scrubber	24590-QL-MRA-MKAS-00003-T0011			N	Provided to Ecology in CCN 267882
Specification Change Notices LAW Add Technical Notes From Material Requisition Into Specification	24590-LAW-3PN-MKAS-00003			N	Provided to Ecology in CCN 267877
Supplier Deviation Disposition Request – LAW Melter Offgas Caustic Scrubber	24590-WTP-SDDR-MS-14-00067			N	Provided to Ecology in CCN 267878
Supplier Deviation Disposition Request – LAW Melter Offgas Caustic Scrubber	24590-WTP-SDDR-MS-14-00070			N	Provided to Ecology in CCN 267882

Engineering Document Title	Document Number	Revision	Permit Conditions	Included	Remarks
Supplier Deviation Disposition Request – LAW Melter Offgas Caustic Scrubber	24590-WTP-SDDR-MS-14-00082			N	Provided to Ecology in CCN 267888
Supplier Deviation Disposition Request – LAW Melter Offgas Caustic Scrubber	24590-WTP-SDDR-MS-14-00085			N	Provided to Ecology in CCN 267884
Supplier Deviation Disposition Request – LAW Melter Offgas Caustic Scrubber	24590-WTP-SDDR-MS-15-00002			N	Provided to Ecology in CCN 267886
Supplier Deviation Disposition Request – LAW Melter Offgas Caustic Scrubber	24590-WTP-SDDR-MS-15-00003			N	Provided to Ecology in CCN 267886
Supplier Deviation Disposition Request – LAW Melter Offgas Caustic Scrubber	24590-WTP-SDDR-MS-15-00007			N	Provided to Ecology in CCN 275843
Engineering Specification for Pressure Vessel Design and Fabrication	24590-WTP-3PS-MV00-T0001	5	III.10.H.5.c.ii III.10.H.5.c.iii III.10.H.5.c.vi	N	In Appendix 7.7 (In LAW-025 package)
Engineering Specification for Seismic Qualification Criteria for Pressure Vessels	24590-WTP-3PS-MV00-T0002	3	III.10.H.5.c.ii III.10.H.5.c.iii III.10.H.5.c.vi	N	In Appendix 7.7
Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication	24590-WTP-3PS-G000-T0002	9	III.10.H.5.c.ii III.10.H.5.c.iii III.10.H.5.c.vi	Y	Incorporate into Appendix 7.7
Engineering Specification for Pressure Vessel Fatigue Analysis	24590-WTP-3PS-MV00-T0003	3	III.10.H.5.c.ii III.10.H.5.c.iii III.10.H.5.c.vi	N	In Appendix 7.7
Secondary Containment Design	24590-WTP-PER-CSA-02-001	10	III.10.H.5.c.ii III.10.H.5.c.iii	N	In Appendix 7.5
Underground Pipe Protection	Not applicable	-	III.10.H.5.c.iv	N	There are no underground pipes in the LAW facility El. 3 ft and above
LAW Vitrification Offgas System Bypass Analysis	24590-LAW-PER-PR-03-001	2	III.10.H.5.c.ix	N	In Appendix 9.18
Installation for Tank Systems and Miscellaneous Unit Systems	24590-WTP-PER-CON-02-001	6	III.10.H.5.c.x	N	In Appendix 7.12

**For Incorporation into the Administrative Record**

**Table of Contents**

<b>Engineering Document Title</b>	<b>Document Number</b>	<b>Revision</b>	<b>Permit Condition</b>	<b>Included</b>	<b>Remarks</b>
Structural Support Calculations for Off Spec, Non-Standard or Field Fabricated Miscellaneous Treatment Subsystems	Not Applicable - See Remarks	-	III.10.H.5.c.iii	N/A	There are no Off Spec, Non-Standard, or Field Fabricated Miscellaneous Unit Subsystems in the LAW Facility
System Description for LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems	24590-LAW-3YD-LOP-00001	3	III.10.H.5.c.vii	N	In Administrative Record CCN 240034
<b>Mass and Energy Balance Documents</b>					
Flowsheet Bases, Assumptions, and Requirements	24590-WTP-RPT-PT-02-005	7	III.10.H.5.c.viii	N	In Administrative Record (In LAW-025)
2010 WTP Material Balance and Steady State Flowsheet Assessment, Deliverable 2.7	24590-WTP-RPT-PET-10-022	0		N	In Administrative Record (CCN 241137)
Steady State (AES) Model Run Report for 2010 Material Balance and Process Flowsheet Analysis Assessment Report	24590-WTP-MRR-PET-10-010	0		N	In Administrative Record (CCN 241137)
<b>Toxic Vapors and Emissions</b>					
Control of Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems	24590-WTP-PER-PR-03-002	3	III.10.H.5.c.xi	N	In Administrative Record (CCN 178564)
<b>Prevention of Hydrogen Accumulation</b>					
Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems	LAW Miscellaneous Treatment Unit Hydrogen Accumulation Document for the DWP Administrative Record (CCN 280210)		III.10.H.5.c.xii	N	In Administrative Record (LAW-025)

# Ecology Proposes Changes to Waste Treatment Plant Design

The [Washington State Department of Ecology](#) (Ecology) is proposing changes to the *Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit*, Revision 8C. This change affects the *Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste* for the Waste Treatment and Immobilization Plant (WTP Permit). The proposed changes are located in Part III, Operating Unit 10.

The proposed changes include three design packages for installation of equipment for the Low-Activity Waste Facility Secondary Offgas/Vessel Vent Process System (LAW LVP System). These design packages are explained on pages 2 and 3.

This proposal is one of many changes to the original WTP Permit. Periodic updates allow the Permittees to continue construction while designing other parts of WTP.

## Waste Treatment Plant Overview

The WTP has three facilities that will separate and process Hanford's tank waste for long-term disposal:

- [Pretreatment Facility](#)
- [Low-Activity Waste Vitrification Facility](#)
- [High-Level Waste Vitrification Facility](#)

At the heart of tank waste treatment is [vitrification](#), or immobilizing waste in solid glass.

In the Pretreatment Facility, tank waste is separated into low-activity waste and high-level waste. (See Terms to Know on page 3 for definitions of wastes.) The waste is then sent to the appropriate vitrification facility, mixed with glass formers, and piped to large heating containers called melters.

During vitrification, the melters will heat tank waste and silica glass formers to 2,100 degrees Fahrenheit. Then the molten liquid will be poured and sealed in stainless-steel disposal containers, where it will cool into solid glass logs (solid waste).

In glass form, the waste is still radioactive. However, the solid waste will be extremely durable and waterproof, which will protect people and the environment for thousands of years as the radioactivity decays.

### Why It Matters

The proposed permit changes affect the [Waste Treatment and Immobilization Plant](#) (WTP).

WTP will immobilize in glass 56 million gallons of dangerous radioactive and chemical waste stored in 177 underground storage tanks at [Hanford](#).

Some waste from the tanks has polluted groundwater that flows toward, and can seep into, the Columbia River. Safely treating tank waste is an important goal to help protect people and the environment.

### Public Comment Period

Permit Modification: 8c.2015.2d

December 28, 2015 -  
February 13, 2016

### To Submit Comments

Please send comments by email (preferred), U.S. mail, or hand deliver them to:

Dieter Bohrmann  
3100 Port of Benton Blvd.  
Richland, WA 99354  
[Hanford@ecy.wa.gov](mailto:Hanford@ecy.wa.gov)

### Public Hearing

A public hearing is not scheduled, but if there is enough interest, we will consider holding one. To request a hearing or for more information, contact:

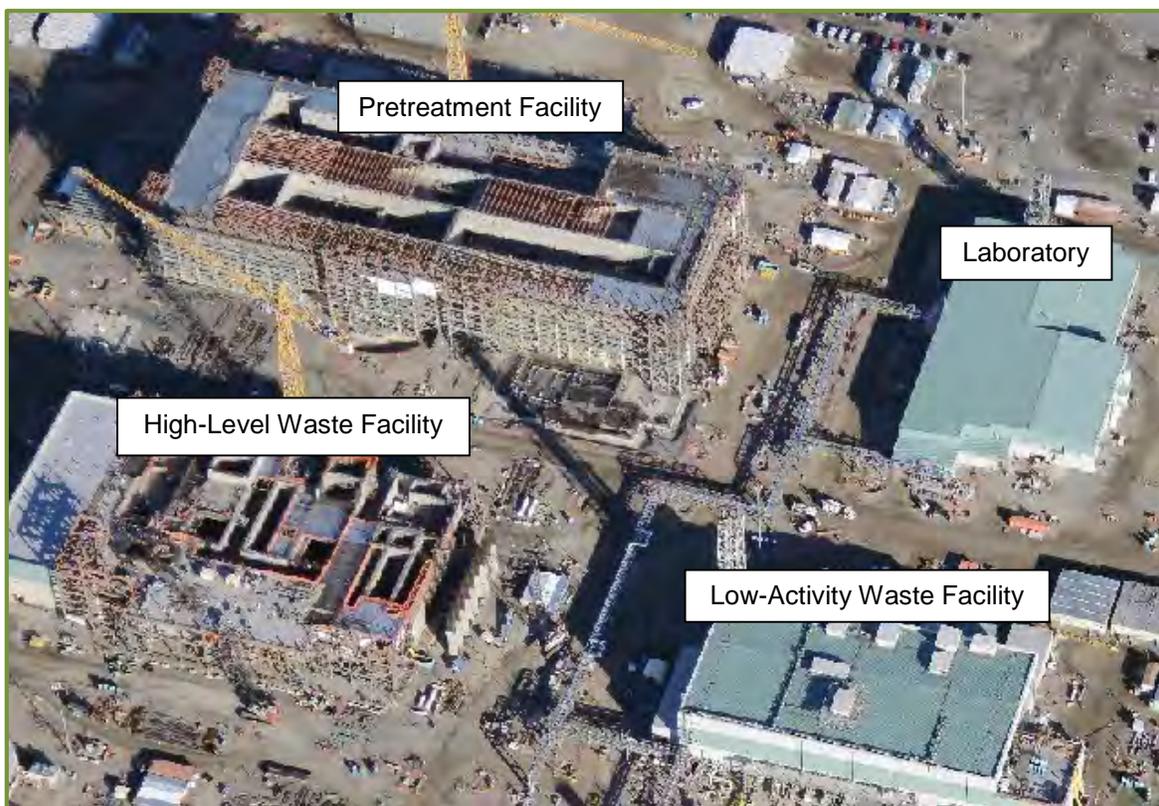
Dieter Bohrmann  
509-372-7954  
[Hanford@ecy.wa.gov](mailto:Hanford@ecy.wa.gov)

### Special Accommodations

To request ADA accommodation, including materials in a format for the visually impaired, call the Nuclear Waste Program at 509-372-7950.

Persons with impaired hearing may call Washington Relay Service at 711.

Persons with speech disability may call TTY at 877-833-6341.



*The Waste Treatment Plant, commonly called the vit plant, in October 2015 (photo courtesy of Bechtel).*

### **Design Package for HEPA Preheaters**

The LAW-026A permit design package addresses the design and installation of the high-efficiency particulate air (HEPA) preheaters, which are part of the LAW LVP System at the 48-foot elevation.

The permit design package was submitted for a 45-day public comment period from September 2 through October 20, 2014. Significant technical issues were raised as a result of comments received during that public comment period.

Ecology withdrew this design package pending resolution of the unresolved technical issues and resulting corrective actions. The U.S. Department of Energy and Bechtel National, Inc. (the Permittees) have addressed the issues, implemented corrective actions, and revised and resubmitted the LAW-026A permit design package to Ecology.

### **Design Package for Thermal Catalytic Oxidizer, Selective Catalytic Reducer, Electric Heater, and Heat Exchanger**

The LAW-025 permit design package addresses the design and installation of the thermal catalytic oxidizer, selective catalytic reducer, electric heater, and heat exchanger equipment, which are part of the LAW LVP System. The equipment components are assembled into a single unit called a thermal catalytic oxidizer skid (TCO skid).

The TCO skid removes volatile organic compounds, carbon monoxide, and nitrogen oxides from the offgas stream. The offgas first passes through the heat exchanger to raise the temperature of the offgas. The electric heater will mainly be used to supplement the heat exchanger during startup.

The thermal catalytic oxidizer converts volatile organic compounds and carbon monoxide in the offgas into carbon dioxide and water vapor. The selective catalytic reducer converts oxides of nitrogen into nitrogen and water using ammonia.

This final reaction significantly increases the temperature of the offgas, so the offgas passes through the heat exchanger again to cool before it moves through the rest of the LVP System.

### Design Package for Caustic Scrubber

The LAW-028 permit design package addresses the design and installation of the caustic scrubber, which is part of the LAW LVP System.

In the LVP System, the melter offgas that has passed through the TCO skid is directed through the caustic scrubber. The scrubber removes residual acid gasses and provides further cooling of the offgas.

The treated offgas is pulled through the LVP System by offgas exhausters and discharged to the atmosphere through the LAW stacks.

### Reviewing the Proposed Changes

Ecology invites you to review and comment on this proposed WTP Permit change. The comment period runs from December 28, 2015, through February 13, 2016.

During the public comment period, documents will be available for review beginning December 28, 2015, on [Ecology's website](#) and at the locations listed on page 4.

#### Terms To Know

**Dangerous Waste Permit:** A State-issued permit allowing facilities to store, treat, and/or dispose of dangerous waste.

**Deep geologic repository:** A long-term nuclear waste disposal site excavated underground, below 980 feet, in a stable geologic environment.

**High-level waste:** Results from reprocessing spent nuclear fuel. This includes liquid produced during reprocessing and solids derived from this liquid waste that contain fission products in sufficient concentrations and other highly radioactive material that, by law, requires permanent isolation.

**Low-activity waste:** Remains after as much radioactivity as is technically and economically practical has been separated from high-level waste. When vitrified, it may be disposed of as low-level radioactive waste in a near-surface facility at Hanford.

**Offgas:** A gaseous radioactive and hazardous byproduct of tank waste treatment.

**Resource Conservation & Recovery Act (RCRA):** Law authorizing the U.S. Environmental Protection Agency to manage hazardous waste, including the generation, transportation, treatment, storage, and disposal of hazardous and other solid waste and waste in underground tanks.

**Underground storage tank:** A tank that is entirely below the surface of and covered by the ground.

At Hanford, two types of underground storage tanks have capacities ranging from 50,000 to 1,000,000 gallons. The single-shell tanks have one steel liner encased in reinforced concrete, and do not comply with State environmental laws. The double-shell tanks have two steel liners in reinforced concrete and contain potential leaks, in compliance with the law.

**Vitrification:** Immobilizing waste by mixing it with glass formers and melting the mixture into a glass form that cools into a solid.

**Waste Treatment and Immobilization Plant:** Facility to thermally treat and vitrify tank waste at Hanford.



3100 Port of Benton Blvd.  
Richland, WA 99354

**Public Comment Period**  
**Hanford's Waste Treatment Plant**  
**Permit Modification: 8c.2015.2d**

December 28, 2015 -  
February 13, 2016

**Hanford's Information Repositories and Document Review Locations**

**Richland**

Ecology Nuclear Waste Resource Center  
3100 Port of Benton Blvd.  
Richland, WA 99354  
Contact: Valarie Peery  
509-372-7950

Dept. of Energy Administrative Record  
2440 Stevens Drive, Room 1101  
Richland, WA 99354  
Contact: Heather Childers  
509-376-2530

Department of Energy Reading Room  
2770 Crimson Way, Room 101L  
Richland, WA 99354  
Contact: Janice Parthree  
509-375-3308

**Portland**

Portland State University  
Branford Price Millar Library  
1875 SW Park Avenue  
Portland, OR 97207  
Contact: Claudia Weston  
503-725-4542

**Seattle**

University of WA Suzzallo Library  
P.O. Box 352900  
Seattle, WA 98195  
Contact: Hilary Reinert  
206-543-5597

**Spokane**

Gonzaga University Foley Center  
502 E Boone Avenue  
Spokane, WA 99258  
Contact: John Spencer  
509-313-6110

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## CLASSIFIED LEGALS

In United States District Court, Eastern District of Washington, Richland.

Basin Disposal, Inc. Plaintiff,

VS No4:15-cv-05078-SMJ

3M Company; et al., Defendants

The State of Washington to the said defendants: Carr Aviation I, LLC; D.G. Shelter Products Company; DiGiorgio Corporation; Freightliner Corporation; Hearin Products, Inc.; James River Corporation; Kalama Chemical Inc.; Liquid Waste Disposal, Inc.; Wood Treatment Chemical Company.

You are hereby summoned to appear within sixty days after the date of the first publication of this summons, to wit, within sixty days after the 29th day of November, 2015 and defend the above entitled action in the above entitled court, and answer the complaint of the plaintiff Basin Disposal, Inc. and serve a copy of your answer upon the undersigned attorneys for plaintiff Basin Disposal, Inc., at their office below stated; and in case of your failure so to do, judgment will be rendered against you according to the demand of the complaint, which has been filed with the clerk of said court. This is an action for the recovery of remedial action and response costs under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. Chapter 103, and Washington's Model Toxics Control Act ("MTCOA"), Chapter 70.105D RCW, for costs incurred in response to releases of hazardous substances at the Pasco Landfill in Pasco, Washington.

Loren R. Dunn  
Mindy L. Deyoung  
Plaintiff's Attorneys.

Ridde!! Williams P.S.  
1001 4th Ave., Suite 4500  
Seattle, WA 98154  
King County  
Washington.  
#2126002 11/29, 12/6, 12/13, 12/20, 12/27/2015 & 01/03/2016

Hanford Dangerous Waste Permit The Washington State Department of Ecology invites you to comment on a proposed change to the permit to correct a regulatory citation error in Permit Condition II.F.2.a and add Permit Condition II.F.4. to Part II, Section F, Groundwater and Vadose Zone Monitoring. When Permit Conditions are changed or added, Attachment 9, Permit Applicability Matrix must also be modified to reflect the changes.

The public comment period runs from December 28, 2015 through February 13, 2016.

Why It Matters **New Permit Condition.** Historically, the groundwater and vadose zone monitoring data collected on the Hanford site has been reported in many formats and at different times during a year. In 2009, the United States Department of Energy (USDOE), the Washington State Department of Ecology (Ecology), the state of Oregon, and the Tribal Nations met to discuss the format for a report of all groundwater and vadose zone data collected during a year (Report). The Report would include all data from various regulations [Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Atomic Energy Act (AEA), etc.] and any project or remediation data. The report would cover a calendar year. The RCRA portion of the an-

Contact: John Spencer 509-313-6110

Your views and concerns are important to the Washington State Department of Ecology. For more information on the public comment period, please contact Dieter Bohrmann at hanford@ecy.wa.gov or (800) 321-2008. #2173174 12/27/2015

### ATTENTION CONTRACTORS INVITATION FOR BIDS East Side Booster Station Upgrade (BS 2.1) Project # CP7-WT-2R-13-02

The City of Pasco, Washington is inviting and requesting bid proposals for the **East Side Booster Station Upgrade Project**. This project involves expanding the existing East Side Booster Station facility, including replacement of the existing diesel engine fire pump with two new electric motor driven pumps equipped with variable frequency drives (VFDs) that have been purchased by the City, installation of a suction pipe gallery, and installation of a dedicated discharge pipe for the proposed pumps. The project also includes replacement of the BPS roof shingles and installation of a built-in crane for future pump and motor maintenance.

Bid documents, including plans and specifications, in the form of a CD, may be obtained beginning **Tuesday, December 15, 2015 at 10:00 a.m.** from the City Engineer's Office, City Hall, 525 North Third Avenue, Pasco, Washington, or by writing to Post Office Box 293, Pasco, Washington, 99301. Bidders must be prequalified to receive a bid package. A non-refundable payment of \$25.00 will be required for each set of documents obtained. **Two optional pre-bid meetings will take place in the Parks Classroom, First Floor-City Hall, 525 North 3rd Avenue, Pasco, Washington on December 29, 2015 at 10:00 am, and on January 5, 2016 at 10:00 am.** Bids shall be addressed to the Mayor and the City Council and will be received at the office of the City Engineer, City Hall, 525 North 3rd Avenue, Pasco, Washington, up to the hour of 2:00 p.m., January 8, 2016 and then shall be opened in the City Council Chambers located on the first floor of the City Hall Building. At the time and date stated, the bids will be publicly opened and read aloud. **Bids are to be submitted only on forms provided in the specifications.**

All bids must be accompanied by a "Good Faith Token" in the form of a Certified Check, Cashier's Check or Bid Bond in the amount of not less than 5 percent (5%) of the total or highest bid. Technical questions regarding the scope of this project should be put in writing and directed to Mr. Daniel S. Ford, P.E., City Engineer, City of Pasco, Public Works, 525 N. 3rd Avenue, PO Box 293, Pasco, WA 99301, Fax (509) 543-5728. **Bids will only be accepted from Contractors who are on the City maintained list of responsible contractors eligible to perform services as governed by PMIC 14.10, and have obtained bid documents directly from the City of Pasco Engineering Division.** The City Council reserves the right to reject any and all bids and to waive technicalities or irregularities, and after careful consideration of all bids and factors involved make the award to best serve the interests of the City of Pasco. DATED: December 10, 2015

Teresa Reed-Jennings, P.E.  
Publish: December 20, 2015  
Project Manager  
#2162740 12/20 & 12/27/2015

**INVITATION FOR BIDS**

mechanical and electrical systems, as well as wall demolition and construction, painting and flooring are included in this contract.

A Mandatory Pre-Bid Conference, for all General Contractor prospective bidders, will be held Tuesday, January 5, 2016, 3:00 p.m. at the project site, 415 North Quay Street, Kennewick, WA.

Preliminary estimated construction: \$800,000

Contract documents may be examined at the following locations after 10:00 a.m., Tuesday, December 15, 2015:

Tri City Construction Council  
20 East Kennewick Avenue  
Kennewick, WA 99336  
(509)582-7424

Port of Kennewick  
350 Clover Island Drive, Suite 200  
Kennewick, WA 99336  
(509)586-1186

Contract documents will be available for purchase on or after Tuesday, December 15, 2015 at the Port of Kennewick, 350 Clover Island Drive, Suite 200, Kennewick WA, (509) 586-1186, for a fee of \$150 per set (limit 2 sets to General Contractors and 1 set for subcontractors). The cost is refundable provided the documents are returned in good condition within 10 days after bid opening. Additional sets may be purchased at cost, non-refundable. DVDs containing PDF versions of the plans and specifications are available for \$5 per set, non-refundable. Plans and specifications will be posted on the Port of Kennewick website, [www.portofkennewick.org](http://www.portofkennewick.org); however, to assure completeness of the bid package, bidder must utilize hard copies of the documents.

Each bid shall be accompanied by a certified check, cashier's check, bank draft, or money order payable to the Port of Kennewick or a bid bond with a corporate surety licensed to do business in the State of Washington, in an amount not less than five (5%) percent of the amount of the bid, including sales tax. Should the successful Bidder fail to enter into such contract and furnish satisfactory performance bond or quality assurance submittals within the time stated in the contract documents, the bid proposal deposit shall be forfeited to the Port of Kennewick. Each Bidder shall warrant that he has not entered into collusion with another bidder or any other person, and does not discriminate in any manner against any person based solely on race, color, sex, or creed. #2160079 12/16, 12/20 & 12/27/2015

**Notice of Election and Registration Deadlines for February 9, Special Election**

The last date to register online or through the mail for the 2016 Special Election is Monday, January 11. Also, registered voters may transfer or update their name or address through Monday, January 11. First time voters can register in person until 5:00 pm Monday, February 1 at any Benton County Voting Center location listed below. Ballots, registration forms, voting assistance to elderly and disabled persons, and other election and voter registration information are available at any Benton County Voting Center location listed below.

**Benton County Voting Centers :**  
620 Market St, Prosser  
5600 W Canal Dr, Kennewick  
101 Wellston Way, Ste F, Richland

A Revised Mitigated Determination of Non-significance, ED 15-31 was issued on November 23, 2015.

**Determination of Completeness :** The application was determined complete on November 5, 2015 for the purpose of processing.

**Project Permits Associated with this Proposal :** None

**Preliminary Determination of Regulations Used for Project Mitigation :** Title 18 (Zoning), Title 17 (Subdivision), Title 4 of the Kennewick Municipal Code and the land use policies contained in the Kennewick Comprehensive Plan.

**Estimated Date of Decision :** Within 10 business days of the Hearing Date of January 11, 2016.

**To Receive Notification of the Decision :** Contact the Development Services Division at 210 W. 6th Avenue, Kennewick, WA 99336 or via telephone at (509) 585-4280.

**Appeal :** Any person aggrieved by the decision of the Kennewick Hearing Examiner on this proposal may appeal to the Superior Court of Benton County within twenty-one (21) days of the date of decision.

Steve Donovan, Planner  
The City of Kennewick welcomes full participation in public meetings by all citizens and does not discriminate on the basis of disability, pursuant to the requirements of the American with Disabilities Act of 1990, pub. L 101-336. No qualified individual with a disability shall be excluded or denied the benefit of participating in such meetings. If you wish to use auxiliary aids or require assistance to comment at this public meeting, please contact the City of Kennewick, Steve Donovan, Development Services Department at (509) 585-4361 or TDD (509) 585-4425 or through the Washington Relay Service Center TTY at #711 at least ten days prior to the date of the meeting to make arrangements for special needs.  
210 W. Sixth Avenue / PO Box 6108, Kennewick WA 99336  
#2175425 12/27/2015

### Public Works Roster

Kahlotus School District #056 hereby announces Public Works Roster is open for registration. Vendors can obtain form @ [www.kahlotusd.org](http://www.kahlotusd.org). Women, minority owned and small businesses are encouraged to apply. [cheider@kahlotusd.org](mailto:cheider@kahlotusd.org) 509-282-3338 #2166767 12/21-12/27/2015

### REQUEST FOR QUALIFICATIONS

The City of Pasco is soliciting statements of qualifications from consultants to assist the City in the preparation (updating) of the Park and Recreation Master Plan dealing with development of park properties and recreation programming and urban forestry. The proposed budget amount may range from \$20,000 to \$25,000.

A "Statement of Qualifications" from consultants experienced in master planning for parks and recreation departments interested in this project should send the following information: (1) The firm's qualifications for performing the work identified, including relevant work experience performed by the firm for other communities; (2) Resumes describing the background, training and experience of the individuals that will be part of the project team; (3) The names, addresses and phone numbers of professional references; (4) Assurances that the firm is capable of performing the work in an expeditious manner. Four (4) complete copies of the statement of qualifications should be mailed (post marked) or delivered on or before

defaults: Late Charges \$79.05 Title Search \$614.06 interest Due \$9,900.00 Escrow Payment \$7,035.33

Property Maintenance \$952.00 Legal Filing Service \$726.00 Grand Total \$19,306.44

The sum owing on the obligation secured by the Deed of Trust is: Principal \$132,000.00, together with interest as provided in the note or other instrument secured, and such other costs and fees as are due under the note or other instrument secured, and as are provided by statute. V. The above-described real property will be sold to satisfy the expense of sale and the obligation secured by the Deed of Trust as provided by statute. The sale will be made without warranty, express or implied, regarding title, possession, or encumbrances on December 4, 2015. The defaults referred to in paragraph III must be cured by November 23, 2015 (11 days before the sale date), to cause a discontinuance of the sale. The sale will be discontinued and terminated if at any time before November 23, 2015 (11 days before the sale date), the defaults as set forth in paragraph I are cured and the Trustee's fees and costs are paid. Payment must be in cash or with cashiers' or certified check from a state or federally chartered bank. The sale may be terminated any time after November 23, 2015 (11 days before the sale date), and before the sale by the Borrower, Grantor, any Guarantor, or the holder of any recorded junior lien or encumbrance paying the entire principal and interest secured by the Deed of Trust, plus costs, fees, and advances, if any, made pursuant to the terms of the obligation and/or Deed of Trust, and curing all other defaults. VI. A written notice of default was transmitted by the Beneficiary or Trustee to the Borrower and Grantor at the following addresses: Amy L Garza 1703 South Kent Street Kennewick, WA 99337 Amy L Garza 16601 Griffin Road Grandview, WA 98930 Amy L Garza 2236 W Bench Rd Othello, WA 99344-9527 Amy L Garza 940 South 10th Avenue Othello, WA 99344 David Garza 1703 South Kent Street Kennewick, WA 99337 David Garza 16601 Griffin Road Grandview, WA 98930 David Garza 2236 W Bench Rd Othello, WA 99344-9527 David Garza 940 South 10th Avenue Othello, WA 99344 Occupant 1703 South Kent Street Kennewick, WA 99337 by both first-class and certified mail on May 22, 2015, proof of which is in the possession of the Trustee; and the Borrower and Grantor were personally served, if applicable, with said written Notice of Default or the written Notice of Default was posted in a conspicuous place on the real property described in paragraph I above, and the Trustee has possession of proof of such service or posting. VII. The Trustee whose name and address are set forth below will provide in writing to anyone requesting it, a statement of all costs and fees due at any time prior to the sale. VIII. The effect of the sale will be to deprive the Grantor and all those who hold by, through or under the Grantor of all their interest in the above-described property. IX. Anyone having any objection to the sale on any grounds whatsoever will be afforded an opportunity to be heard as to those objections if they bring a lawsuit to restrain the sale pursuant to RCW 61.24.130. Failure to bring such a lawsuit may result in a waiver of any proper grounds for invalidating the Trustee's sale. X. NOTICE TO OCCUPANTS OR TENANTS - The purchaser at the trustee's sale is entitled to possession of the property on the 20th day following the sale, as against the grantor under the deed of trust (the owner) and anyone having an interest junior to the deed of trust, including occupants who are not tenants. After the 20th day following the sale the purchaser has the right to

ide, and nitrogen oxides from the offgas stream. The offgas first passes through the heat exchanger to raise the temperature of the offgas. The electric heater will mainly be used to supplement the heat exchanger during startup.

The thermal catalytic oxidizer converts volatile organic compounds and carbon monoxide in the offgas into carbon dioxide and water vapor. The selective catalytic reducer converts oxides of nitrogen into nitrogen and water using ammonia.

This final reaction significantly increases the temperature of the offgas, so the offgas passes through the heat exchanger again to cool before it moves through the rest of the LVP System.

**Design Package for Caustic Scrubber**  
The LAW-028 permit design package addresses the design and installation of the caustic scrubber, which is part of the LAV LVP System.

In the LVP System, the melter offgas that has passed through the TCO skid is directed through the caustic scrubber. The scrubber removes residual acid gasses and provides further cooling of the offgas.

The treated offgas is pulled through the LVP System by offgas exhausters and discharged to the atmosphere through the LAW stacks.

This is a brief summary of the changes proposed for the WTP Permit. To review the proposed modification in detail beginning December 28, 2015, visit the Washington State Department of Ecology website at <http://www.ecy.wa.gov/programs/nwp/commentperiods.htm>.

You can also review the proposed modification at one of the Hanford Public Information Repositories:

Washington State  
Department of Ecology  
Nuclear Waste Program Resource Center  
3100 Port of Benton Boulevard  
Richland, Washington 99354  
Contact: Valarie Peery 509-372-7950

Portland State University  
Branford Price Millar Library  
1875 Southwest Park Avenue  
Portland, Oregon 97207  
Contact: Claudia Weston 503-725-4542

United States Department of Energy  
Administrative Record  
2440 Stevens Drive  
Richland, Washington 99354  
Contact: Heather Childers 509-376-2530

University of Washington  
Suzzallo Library  
PO Box 352900  
Seattle, Washington 98195  
Contact: Hilary Reinert 206-543-5597

United States Department of Energy  
Reading Room  
2770 Crimson Way  
Richland, Washington 99354  
Contact: Janice Parthree 509-372-7443

Gonzaga University  
Foley Center  
502 East Boone Avenue  
Spokane, Washington 99258  
Contact: John Spencer 509-313-6110

Your views and concerns are important to the Washington State Department of Ecology. For more information on the public comment period, please contact Dieter Bohrmann at hanford@ecy.wa.gov or (800) 321-2008. #2173066 12/27/2015



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This is a message from the Washington Department of Ecology

Ecology welcomes your input on proposed modifications related to the Hanford Dangerous Waste Site-wide Permit. Public comments will be accepted through February 13, 2016.

- One comment period is for a modification to the Waste Treatment and Immobilization Plant (WTP) Permit. The proposed changes include three design packages that address the design and installation of equipment that is part of the secondary offgas/vessel vent process system for the Low-Activity Waste Facility. The WTP is being designed and built to treat the 56 million gallons of dangerous radioactive and chemical waste from Hanford's 177 underground storage tanks. For a summary of the proposed changes, please see our [Focus Sheet](#).

- The other comment period is for proposed changes to the Part II Permit Conditions of the Hanford Site-wide Permit. One permit condition is being modified to correct a regulatory citation to define a resource protection well. Another permit condition is being added to change the due date for the U.S. Department of Energy to submit to Ecology the Annual Groundwater Monitoring Report. For a summary of the proposed changes, please see our [Focus Sheet](#).

More detailed technical information on these proposed modifications is available on the Washington Department of Ecology's [website](#) and at the [Hanford information repositories](#).

Questions or comments? Please contact us at [Hanford@ecy.wa.gov](mailto:Hanford@ecy.wa.gov) or 509-372-7950.



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## **APPENDIX B: COPIES OF ALL WRITTEN COMMENTS**

January 15, 2016

Dieter Bohrmann  
Washington Department of Ecology  
3100 Port of Benton Blvd  
Richland, WA 99354

Dear Mr. Bohrmann:

Following is a comment regarding Permit Modification 8C.2015.2D, *Changes to the Waste Treatment Plant Design*. (Comment period from December 28, 2015 to February 13, 2016.)

This permit modification is intended to allow installation of the Low Activity Waste (LAW) facility thermal catalytic oxidizer, (TCO), selective catalytic reduction unit (SCR), caustic scrubber, and HEPA heater equipment.

Installation of this equipment is not supported by the faulty and incomplete state of the WTP design. Many issues are not resolved. Many have also been inappropriately closed. In addition, DOE oversight continues to misrepresent findings at a lower level of severity than warranted.

To start, please see letter 15-WTP-0141, "*Level 2 Assessment Report S-15-WED-RPPWTP-005, Low-Activity Waste Primary Offgas Process and Secondary Offgas/Vessel Vent Process Technical Issue Status Report*", dated January 8, 2016. This report identifies numerous unresolved problems with the LAW offgas equipment, including issues that were inadequately closed, some that were only "apparently" closed (including temperature issues in the caustic scrubber), and many that are still open. There is tremendous uncertainty in the train of process operations, and therefore there is tremendous uncertainty in the ability to treat and contain dangerous waste. Four issues were closed "with concerns," five were not tracked at all, thirty-six are still open, and three only "appeared to be" resolved, without further investigation by DOE. The review for this assessment was conducted between May 1, 2015 and July 1, 2015. As a result, DOE knew of and ignored this information prior to the current permit modification request.

Another concern is that DOE did not identify the unsupported closure of issues as a formal finding – only an "opportunity for improvement." This represents another example of the misrepresentation or "dumbing down" of findings as was flagged in a recent DOE Headquarters QA Audit. The consequences are that the issues will not have causal analyses or have a hope of genuine integrated correction. Please see EM-PA-15-14, which is attached to a headquarters

memorandum dated July 1, 2015, "*Report for Quality Assurance Audit EM-PA-15-14 of Technical and Regulatory Support at the Office of River Protection.*" Other issues, including those in the non-published LAW Design and Operability Review Report, may similarly be played down in importance.

In addition, the problems are continuing:

Corrective actions have not been taken to preclude recurrence related to failures in supplier calculations. What is the condition of the design and process calculations for the LAW offgas system equipment treatment train? One reference for this is Condition Report 24590-WTP-GCA-MGT-16-00067.

Corrective actions have not been implemented in recent ALARA design reviews. What is the condition for the LAW offgas equipment? Will worker exposure to chemicals and radiation be managed properly? Were the source terms adequately estimated? See Condition Report 24590-WTP-GCA-MGT-15-01983.

Leak testing of the LAW heating elements for the Thermal Catalytic Oxidizer at the mounting plate joints is "not feasible." Why was the system designed so that the confinement ability can't be verified? See Condition Report 24590-WTP-SE-NS-15-0255.

How many total, integrated problems are not resolved? How much faith does Ecology have in promises that the corrective actions programs and plans will fix it someday, "if you only let us install it now?" Fixes for one problem that allow a deviation often create other problems in related equipment or systems.

This permit modification is premature and WTP is nowhere ready for future installations.

Dear Mr. Bohrmann:

This letter provides comments in response to the Department of Ecology's invitation for public review of proposed modifications to the Hanford Dangerous Waste (RCRA) Permit, specific to the Waste Treatment and Immobilization Plant (WTP)<sup>1</sup>.

The proposed changes to the Dangerous Waste Permit are intended to allow continued construction of the Low Activity Waste (LAW) Vitrification Facility, in particular the Off-Gas System. The DOE-Bechtel partnership proposes to install Thermal Catalytic Oxidizer/Selective Catalytic Reduction (TCO/SCR) equipment, the LAW Caustic Scrubber, and the LAW HEPA Preheaters.

Relevant requirements associated with this change proposal are:

- **Permit Application Requirements.** WAC-173-303-803(4)(a) states for New TSD facilities: "Except as provided in 40 C.F.R. 270.10(f)(3) for TSCA facilities [PCB Incinerator], *no person may begin physical construction of a new TSD facility without having submitted parts A and B of the permit application and having received a finally effective final facility permit.*" WTP is not a TSCA Facility. WAC-173-303-803(4)(b) further states that application are required to be submitted at least 180 days before physical construction is expected to begin.
- **Final Facility Permits.** WAC-173-303-806 defines the contents of a final facility permit, which must include:

*A description of procedures, structures, or equipment used at the facility to:*

*Mitigate effects of equipment failure and power outages,*

*Prevent undue exposure of personnel to dangerous waste, and*

*Prevent releases to the atmosphere.*

Also:

*The owner/operator must demonstrate that the facility can and will be designed to resist seismic ground motion and that the design is sufficient to withstand the maximum horizontal acceleration of a design earthquake specified in the demonstration.*

Also:

*A detailed description of the unit being used or proposed for use, including the following: Physical characteristics, materials of construction, and dimensions of the unit; Detailed plans and engineering reports describing how the unit will be located, designed,*

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<sup>1</sup> Department of Ecology Publication 15-05-015, dated December 28, 2015, located at <https://fortress.wa.gov/ecy/publications/documents/1505015.pdf>.

*constructed, operated, maintained, monitored, inspected, and closed to comply with the requirements of WAC 173-303-680(2) and (3);*

- **Permit Conditions** as provided in Ecology’s public review package, which include requirements for submittal of:

***Mass and energy balance** for normal projected operating conditions used in developing the Piping and Instrumentation Diagrams and the Process Flow Diagrams, including assumptions and formulas used to complete the mass and energy balance, so that they can be independently verified for incorporation into the Administrative Record. [See, for example: III.10.E.9.c.viii, III.10.E.9.d.xi, III.10.G.10.c.viii, III.10.G.10.d.xi, and III.10.H.5.c.viii.]*

***Design criteria** (references to codes and standards, load definitions, and load combinations, materials of construction, and analysis/design methodology) and typical design details for the support of the equipment...Documentation will include but not limited to, supporting specifications, test data, treatment effectiveness report, etc. supporting projected operational capability (e.g. WESP projected removal efficiency for individual metals, halogens, particulates, etc.) and compliance with performance standards specified in Permit Condition. [See, for example: III.10.H.5.c.iii, III.10.H.5.d.iii]*

A review of the proposed permit modifications and documentation and the relevant requirements shows clearly that:

## **I. Pretreatment is the Only Permitted Source of Feed to the LAW Facility**

In every document submitted for the DW Permit, the basis for feed to the LAW Facility is the WTP Pretreatment facility.

The permit package ignores new projects that will alter the feed and operation of the LAW Facility.

DOE and Ecology have acknowledged in court filings that the WTP Pretreatment Facility has failures that will result in design and process changes. For example, the DOE proposal of March 31, 2014 to amend the consent decree, states: “*the overwhelming technical judgment is that the WTP cannot operate under the current design, and therefore a new approach is needed.*” And: “*It has become clear...that unresolved technical issues could prevent the Pretreatment Facility from operating safely as currently designed.*”

The DOE proposal of March 31, 2014, includes “re-work” facilities planned in order to implement a “backfit” to a different feed process in response to the WTP design failure. These include Direct Feed Law Vitrification, (DFLAW) and a tank farm LAW Pretreatment System, (LAWPS), and a new end process Effluent Management Facility (EMF) which are new designs currently in the conceptual design phase. EMF is needed to manage wastewater that was previously routed to the WTP Pretreatment facility.

In spite of the admitted design failures in Pretreatment, the Chapter 4.0 Process Information located in the Permit Change Package does not contain any reference to DFLAW, LAWPS, or EMF. Instead it states that WTP will receive feed from the tank farms meeting envelope specifications A, B, C, and D, and “the waste feed will be stored and subsequently treated in the pretreatment facility prior to vitrification.” The process information is therefore no longer valid.

## **II. The Pretreatment Permit Should be Cancelled**

DOE has proposed that Pretreatment cannot be corrected and started until December 31, 2039. As a result, the Pretreatment portion of the RCRA/Dangerous Waste Permit (DWP) should be rescinded, because the technical information in the permit is not valid. DOE’s Brief to the District Court on November 13, 2015 states: “...*redesigning these facilities [Pretreatment and High Level Waste] in response to the technical issue resolution may require altering designs for equipment, components, or process...*” And DOE is not planning to have a redesigned and verified Pretreatment Facility Design until on or after December 31, 2024, according to DOE’s proposed order, also dated November 13, 2015.

Pretreatment has multiple documented failures. Design changes through 2024 are expected.

Despite knowing that the Pretreatment portion of the permit has “*a lot of information that is out-of-date; like for example the P&IDs*” DOE and Ecology agreed they were both “reluctant” to put a hold on the entire Pretreatment Facility in the Permit (see Section 5 of CCN-280037). The unsupported agreement is contrary to the WAC-173-303-803(4)(a) and WAC-173-303-806 requirements for a final, effective permit, prior to construction. A valid basis was not given for the agreed decision to maintain the obsolete PT Permit.

## **III. Feed Using the New Facilities has not been Analyzed**

The DFLAW early start retrofit process does not have a valid feed specification. This is documented in WTP Contract Modification 350, which is dated June 11, 2015. The “TBD” entry for DFLAW feed (Envelope E) is still in the current contract statement of work. This statement of work shows DOE will only comment on and not approve the new TBD feed specification for “Envelope E”. This is a more lax approach than was used for the original feed specifications.

The DFLAW Feed has not been analyzed. DOE/Bechtel do not know if DFLAW is sized properly or if it will be durable or operate properly.

While DOE has released a hold on the basis of design document for including DFLAW, the accepted status is that “there is no single design document that bounds the design limits of the DFLAW configuration, *except those in place between PT and LAW.*” “When Envelope E is clearly defined in the contract, a *future* BODCN can address it.” See the attachment to 15-WTP-0186.

Note that 15-WTP-0187 also commits to creating design limits using a combination of ICD-30 (DFLAW Feed Interface, which also has TBDs) and the Process Inputs Basis of Design (PIBOD)

calculation (WTP-DB-PET-09-001). The PIBOD calculation depends on Pretreatment for calculating the LAW Feed and so is not relevant to DFLAW. This approach is fraught with QA problems and will be forced to use assumptions that will be difficult, if not impossible, to verify. DFLAW starts with cesium removal in the tank farms. It will not have the same sodium additions for aluminum solubility and it will not have the same vessel washes or flushes or other chemical additions or recycles, as would occur in Pretreatment.

The above is contrary to the permit conditions that require valid design criteria and a valid mass and energy balance for a final effective permit.

Continued installation of the TCO/SCR, Caustic Scrubber, HEPA Preheaters, or any LAW equipment in the absence of a feed specification, proper design requirements and proper design-basis mass balance, is contrary to WAC-173-303-806 and represents a fraud on the public, perpetrated at the expense of safety.

#### **IV. The DW Permit Lacks a Valid Mass and Energy Balance**

The Statement of Basis provided by Ecology for the public review period identifies the Mass and Energy Balance for the WTP Permit, including the following in association with Permit Condition III.10.H.5.c.viii.

*Flowsheet Bases, Assumptions, and Requirements*, 24590-WTP-RPT-PT-02-005, Rev 7, dated May 30, 2013. <http://pdw.hanford.gov/arpir/pdf.cfm?accession=0079066H>.

*2010 WTP Material Balance and Steady State Flowsheet Assessment, Deliverable 2.7*, 24590-WTP-RPT-PET-10-022, Rev 0, dated December 12, 2010, and

*Steady State (AES) Model Run Report for 2010 Material Balance and Process Flowsheet Analysis Assessment Report*, 24590-WTP-MRR-PET-10-010, Rev 0 dated December 6, 2010.

None of these three documents addresses the mass, energy, or applicability of flowsheet basis technology development limits associated with Direct Feed LAW from the LAW Pretreatment System. They all rely on or describe feed from the (failed and outdated) Pretreatment facility. Flowsheet Deliverable 2.7 and the associated Steady State Model (AES) were eliminated from the WTP Contract and are no longer valid tools. As a result, Deliverable 2.7 for the steady state mass balance is absent from the current contract Statement of Work. The mass balance documents were also produced earlier than the most recent version of the *Flowsheet Bases, Assumptions, and Requirements* document (BARD).

The DW Permit Mass and Energy Balances are outdated and do not address the new LAW Pretreatment System, DFLAW, or the new Effluent Management Facility.

The Steady State Model further does not address the range of normal and expected operating conditions. The Steady State model was noted in 2009 as applying to only a small fraction of waste batches, according to an External Technical Review Team. Therefore it cannot project the range of normal operating conditions or establish nominal conditions (arising from the variety of individual feeds), as required in Permit Condition III.10.H.5.c.viii. It is out of date, uses the wrong unit operations, and is limited in scope. In addition, there is no tie to data tables in the

Process Flow Diagrams (PFDs), which, contrary to best industry practice, have no data tables to show temperatures, pressures, pH, flow rates, or components of interest. This differs from other PFDs in the permit (such as for ETF).

The DOE-Bechtel Partnership plans to operate the LAW facility with feed from a new project (LAWPS) and to treat the resulting effluent using another new effluent management facility (EMF) instead of having a recycle to Pretreatment. LAWPS and EMF are new designs that are not incorporated in the DW Permit Process Flow Diagrams (PFDs) or in the WTP design basis mass balances (known as APPS/PIBOD and WEBPPS).

The DFLAW Retrofit, LAWPS, and EMF facilities are all in the conceptual design stage. These efforts so far are not using properly verified and validated software or appropriate design calculations, and they are not identifying assumptions requiring verification.

For example, a recent calculation (see RPP-RPT-59001) for a source term estimate for the EMF states that it contains “no assumptions.” This calculation is in addition based on the *not-to-be-used for design* HTWOS model. This calculation cannot accurately model EMF because there is no design-basis feed to DFLAW and HTWOS is not design quality software for WTP. So, despite the claim, there are unstated assumptions. The calculation therefore has no indication of the assumptions that require validation in order to be used for a design analysis.

The Hanford Tank Waste Operations Simulator (HTWOS) model is not validated for design use per NQA-1. The HTWOS model design document calls out clearly that HTWOS is a non-safety, non-quality affecting software application that is “not used in design activities.” See RPP-50816 Pages 9 and D-9.

DOE does not know if the LAWPS project will have to add sodium to the tank waste in order to provide feed that would be the same as feed that would have come from the Pretreatment Facility. The failed Pretreatment flowsheet added sodium to leach aluminum and to keep aluminum in solution and prevent precipitation. Pretreatment also added other chemicals due to operations associated with acid recovery, tank flushes and acid cleaning, etc. DOE does not know what other chemical adjustments and costs might be needed in the LAWPS pretreatment facility to account for other chemical changes caused by the now absent Pretreatment Unit Operations. DOE does not know the consequences of feeding the LAW Facility directly from tank farms without adjustment, as is planned.

If DOE does not adjust the LAWPS so that it matches the changes that would have been made in Pretreatment, then the LAW equipment is vulnerable to unknowns, including elevated ratios of corrosion causing compounds (chlorides and fluorides) to sodium, increased concentrations of acid gasses (SO<sub>x</sub>) and increased NO<sub>x</sub> flows for which the equipment was not designed. These changes are required to be subject to NQA-1 change control and configuration management processes, and must be analyzed before the design can be considered complete. To issue a permit and allow construction is not supported by the available data. If the thermal catalytic oxidizer is installed, it will be an irreversible action, as the roof will then be placed on the LAW facility, and there is no provision to replace the unit.

DFLAW is a retrofit process – it is a change process that requires careful analysis of the consequences of fundamental changes in input.

In addition, the new EMF facility depends on the operation of the upstream, unverified, LAW equipment. The flows in the submerged bed scrubber and the WESP impact the flow rate and composition in the EMF.

And EMF too is not reflected in the DW Permit Process Flow Diagrams or design basis mass balance. And Bechtel has cancelled the steady state flow sheet cited in the permit conditions, and DOE has removed it from the contract.

EMF calculations are not at the final design state – yet the calculation even go so far as to say there are “no assumptions.” This is a red flag that calls for a process and QA audit of the EMF design basis and the WTP mass and energy balances. Scoping evaluations using the tank farms HTWOS model are not valid as a validated and verified software tool for WTP design.

DOE will claim that the review of the impact of changing the feed process can “wait until commissioning.” This is not so. You cannot wait to analyze the changes until commissioning. First, the installations will be irreversible so there will be difficulty in replacing any non-usable or wrong-sized equipment. Second, commissioning will create lethal chemical hazards even if a non-radioactive simulant is used. Nitrates are a big part of the waste and they are converted to lethal NOx gas in the melter, even when the simulant is not radioactive. To postpone discovery of problems until commissioning is a fraudulent activity that is contrary to the Quality Assurance requirements of NQA-1 and to the requirements for integrating safety into the design (DOE-STD-1189). It also represents a corrupt means to achieve more rework, which is the primary product of this project.

## **V. The LAW Design has Unresolved Problems**

The DOE-Bechtel Partnership is aware of significant vulnerabilities as documented in a partial LAW Design and Operability Review (Pre-Decisional Draft) and elsewhere but has not resolved them.

Quality, Operability, and Safety Failures are Not Resolved and the Full Extent of Condition is Not Known. These problems affect permit conditions.

In addition to the LAW Design and Operability (D&O) Report, DOE has not completed a review of the remaining 13 interfacing LAW systems, which can impact equipment subject to the DW Permit. Contrary to testimony by DOE officials to the DNFSB on August 26, 2015, the LAW D&O Review was not a self-identified confirmation that all problems have been identified.

DOE Officials testified to the DNFSB on August 26, 2015:

*“It was a draft report that we commissioned ourselves...”*

*“to drive and identify all of the physical possible issues left to go and turn up all the rocks and question everything more than once”*

*“less than five percent of what is in that report is what we call new material”*

Contrary to this testimony, the LAW Design and Operability report was not commissioned by ORP, but was directed by the Chief of Nuclear Safety, in a letter dated January 28, 2014, as a result of an external construction project review.

Contrary to this testimony, the Design Review Plan, 14-WTP-0042, states this was a partial review of only some of the systems.

Other unresolved problems with the LAW Facility include:

- The Hazards Analysis is not complete. –DOE in letter 15-TRS-0026 notes that “the proposed control strategy for offgas events is underdeveloped and does not demonstrate adequate protection of the facility worker in the event of an offgas system release to normally occupied areas.” This letter cites ammonia and carbon dioxide as potential hazards. Ammonia is a process chemical used in the LAW TCO/SCR.

Further, DOE letter 15-TRS-0029 approves a delay for the submittal of the LAW Facility Hazards Analysis and Preliminary Documented Safety Analysis (PDSA) change package until March 2016. It will require some time after that to complete the review and approval process. New safety structures, systems, and components for the LAW facility are expected to be proposed. Integration of safety in the design is incomplete.

As a result, WAC-173-303-806 effective final facility permit required contents are incomplete for the description of procedures, structures, or equipment used at the facility to mitigate effects of equipment failure and power outages, prevent undue exposure of personnel to dangerous waste, and prevent releases to the atmosphere.

- A 2015 Consent Order written by the DOE Office of Enforcement and signed by Bechtel included an \$800,000 fine associated with long-term safety integration and quality failures.
- The DOE Office of Inspector General found profound procurement and quality problems in Audit Report DOE-OIG-16-03. This report notes that, while Bechtel is using a Managed Improvement Plan (MIP), “Office of River Protection officials noted that Bechtel has initiated corrective actions in the past only to have the issues reappear over time.” The auditor’s comments included: “we disagree with management’s comment that the report did not identify any issues that had not been previously identified by either the Department or Bechtel. Our report acknowledges the issues identified by the Department and Bechtel. However, several new issues we identified in this report include the following: (1) the magnitude of the issue with nonconforming parts and material, (2) the Office of River Protection’s ineffective oversight over Bechtel’s backcharging practices, and (3) Bechtel’s problems resolving root causes of these issues.”

Quality defects in the procured equipment affect the safety function and show the need for detailed process and QA audits of the LAW equipment as applied to DFLAW feeds before a permit can be considered final and effective. While Bechtel is “in the process” of implementing corrective actions – those actions are not verified complete and do not

address DFLAW interfaces. NQA-1 does not allow closing a corrective action to a promise for a future activity.

- Even now, the DOE Office of Inspector General is about to publish a delayed report titled “*Corrective Action Program at the Waste Treatment and Immobilization Plant.*” The review draft was dated June 2, 2015. The draft concluded that “the WTP corrective action program was not fully effective in managing and resolving issues.” Reliance cannot be made on *promises* or plans for corrections in the LAW facility as a result. While comments were transmitted in September 2015, the report is not yet issued, in spite of the OIG’s commitment to release such reports within 60 days after receiving management comments. Additional examples of failures in the Corrective Actions Management System are documented in Project Condition Reports, which have detected problems such as inadequate closure of corrective actions, inadequate tracking of condition reports, and corrective action management software failures. Movement of condition reports from one facility to another (“shell game”) has also hampered issue tracking. Inconsistent labeling of systems (as noted in the LAW D&O report) makes it difficult to search or identify the full set of condition reports for equipment.
- DOE issued an Audit of Commercial Grade Dedication in August of 2015. Commercial Grad Dedication (CGD) is used to verify that the design meets its requirements and the equipment will perform its function. Specifically, when equipment has an assembly or component part that is a commercial grade item, NQA-1 requires that the characteristics of the item to be verified for acceptance and the acceptance criteria for those characteristics shall be documented. DOE’s audit identified multiple CGD failures, including for LAW equipment and LAW Vendors associated with the current permit change request. Bechtel issued a “Level A” Condition Report, which is the most serious level of finding. Further, this is a repeat issue from a previous consent order and \$170,000 fine, NCO-2010-03. Persistent CGD issues and failures to show the equipment will perform its functions are not addressed in the Permit and the findings are not closed.

A “Final” Permit for any portion of the LAW Facility cannot possibly by[sic] called “complete” at this time. Final designs are needed to ensure verification of unverified assumptions, proper integration with upstream and downstream equipment, and resolution of indeterminate quality work.

## **VI. Ecology has Violated WAC-173-303-803(4)(a)**

As shown above, the information necessary for a final, effective permit as required by WAC-173-303-803(4)(a) does not exist.

Ecology has allowed construction before having a Final/Effective Permit. Ecology’s decision to allow a phased approach to permitting is not valid.

Of not is that Ecology has responded to previous comments by referring to a previous decision to make an exception to this requirement. Ecology’s previous decision is no longer valid, as shown below.

Ecology's response to comments in Publication 14-05-004 referred to a Fact Sheet, (Ecology Publication 01-05-005, dated September 2002) to describe the "phased permitting approach" approved by Ecology in 2002 for the WTP permit. This phased approach allowed DOE and Bechtel to submit design information into the permit and to continue construction before a complete design was available. This has been contrary to WAC-173-303-803(4)(a) for a period of more than 13 years.

Ecology's Publication Web Page for publications shows that the fact sheet from September 2002 is actually Publication 01-05-006.

The 2002 Fact Sheet states the basis for Ecology's decision to ignore the requirement for final design before construction was schedule pressure: *"The amount of time it would take to complete the detailed design and follow a traditional permitting process would delay construction up to four years."* But many more than 4 years have passed. If construction had been delayed to wait for a final, integrated design, much time and billions of dollars could have been saved. Instead, this failed decision has contributed to a stove-piped cycle of endless rework.

Nor has the risk reduction anticipated in Publication 01-05-006 occurred. There will be no *"treatment through verification, of at least 10% of the tank waste by volume and 25% by radioactivity by 2018."* Indeed – the current DFLAW process just dumps removed cesium-137 back into the tanks.

In publication 01-05-006, Ecology relied on Bechtel's claims of success with fast track design-build for other projects as a basis: *"The Bechtel Group, including BNI, has successfully used the close coupled EPC process for decades to design and construct major capital projects across the industrial sectors Bechtel supports."* However no specific nuclear success examples were cited and no such success has occurred as promised at WTP.

Ecology was not alone in approving fast track construction before final design. DOE also approved a fast track design-build approach where construction is allowed without having a final design for all interfacing equipment and systems (stove-piped approach) in 2003, but recently and clearly rejected that as a good decision (in addition to the prohibition already contained in DOE Order 413.3B). The Secretary of Energy issued a letter on December 1, 2014, with an attached Report of the Contract and Project Management Working Group. This report states in the Section 5.4.4 Case Study of WTP that *"The use of a fast track approach for first of a kind nuclear plan consisting of multiple nuclear facilities was a bad acquisition approach. It is the primary factor for the significant cost increases and schedule delays that have ensued over the years. There continues to be significant performance risk associated with this project."*

Further, the Secretary of Energy elaborated on June 8, 2015 that before achieving Critical Decision 2, which precedes construction, nuclear construction projects are required to have a 90 percent final design complete (for the whole project). And this letter includes a definition of 90 percent final design and required documents ahead of construction to mean:

- Complete final drawings and specification that may be released for bid and/or construction

- A current and detailed cost estimate
- A current construction schedule
- Clearly defined testing requirements and acceptance criteria for the safety and functionality of all subsystems
- Independent technical, construction, operation and environmental reviews of the final drawings and specifications
- A quality control review that evaluates both technical accuracy and discipline coordination
- A final design that meets all the requirements stipulated in the Code of Record
- A final design review that should be merely be a final validation of comment resolution from previous reviews and a review of any additional developments since the last review
- The checking and verification of any required waivers or exemptions
- Final design report
- Final design review report
- Preliminary documented safety analysis
- Safety evaluation report

No such set of information is available for the LAW facility, the DFLAW retrofit project, the LAWPS project, or for the Effluent Management Facility, which are all interlinked. These designs cannot be made final in pieces without repeating the consequences of the design-build primary-cause acknowledged failure.

DOE has rejected fast track Design-Build. Why should Ecology allow it to continue with the present permit package? Ecology's phased approach decision from 2002 should be revoked.

## **VII. Quality and Safety Problems Persist**

In Publication 14-05-004 Ecology responded to public comments on the permit in 2013 by promising to conduct quality determinations: *"Ecology is undertaking several quality determination measures for equipment or systems that have already been constructed, as well as for components that have not yet been installed."*

Ecology's Commitments to the Public to perform Quality Reviews and to rely on completed Safety Reviews is not met.

- Contrary to Ecology's Commitment to a quality review, the response to comments on installation of the LAW Preheater (See Publication 15-05-004) was to withdraw the 2014 proposed installation due to issues raised by the public. The public comments included unacceptable materials of construction and an inadequate process corrosion data sheet. Ecology withdrew the permit modification request, noting that there were "significant unresolved issues."

What did Ecology do to review quality before allowing the current design package?

Further, Ecology committed in the 2002 Publication 01-05-006 to using DOE's safety evaluation documents to verify safety. Why then does Ecology accept the incomplete hazards analysis for

LAW equipment (See 15-TRS-0029), even specific to the ammonia used in the TCO/SCR? Why does Ecology accept continued construction with the outstanding \$800,000 fine for safety failures and corrections not completed in the 2015 Office of Enforcement Consent Order?

Below are comments on the specific documents in the proposed change package that demonstrate persistent quality problems. Please note that these comments are a few examples from a cursory review.

## CAUSTIC SCRUBBER COMMENTS

On the Caustic Scrubber Data Sheet 24590-LAW-MKD-LVP-00011, Rev 6 there is a reference to Not 7 (see pages 10 and 11). Note 7 (page 12) states that the vendor will provide a verification/supply the pH operating conditions. Contrary to this note, no vendor operating inputs were provided.

The corrosion evaluation 24590-LAW-N1D-LVP-00001, Rev 7 assumes that the nominal pH will be 9.5 (see page 3), without a basis that explains this. However, Section 4 and the conclusion of the corrosion evaluation (sheets 4 and 6) state that “In the region of the scrubber where there is potential for high temperature, presence of acid gases, and the potential use of acid for cleaning, Hastelloy® C-276 or C22® offer resistance to corrosion both at low pH from acid gas and high pH from the sodium hydroxide.”

There is no means to control the caustic scrubber wall temperature. Conduction is ignored. This is not safe-by-design.

Sheet 2 of the corrosion evaluation (operating restrictions) then indicates that the process will be controlled to meet the corrosion limits for type 316 stainless steel, which makes up the sides, but not the bottom of the scrubber. So – Bechtel has modified the chemical process to match the side wall material already selected in a non-conservative way (assuming a lower temperature). Bechtel did not select materials that match the process. And the process is not understood. There is no engineered feature to control temperature up the side walls of the scrubber. The requirements for nuclear design include a hierarchy that requires a robust design as a priority over administrative or operational controls (DOE-STD-3009). This philosophy has been abandoned for the caustic scrubber in the haste for installation.

The design limits in the corrosion evaluation (sheet 6) are limited to a range of pH of 5 to 10, without recourse to a vendor input. The design limits cite 24590-WTP-RPT-M-11-002, which is not a vendor document, but refers to conditions suitable for type 316 stainless steel. The corrosion evaluation data table (sheet 9 of 24590-LAW-N1D-LVP-00001, Rev 7), however shows the pH of the liquid input to the scrubber as **11.43** (noted as not being a maximum), which *exceeds the corrosion analysis range*.

The corrosion evaluation shows (sheet 13) that caustic is added at 5M NaOH. This concentration is more than sufficient to generate a pH 14 solution. Sheet 13 also notes that the pH can be raised to 14 in normal operations if needed to control high halide concentrations.

The Flowsheet Bases, Assumptions, and Requirements Document (BARD), 24590-WTP-RPT-PT-005, Rev 7 says that the caustic scrubber solution is supposed to be at a concentration of 0.01 Molar NaOH (See page 2.13-9). This is the same as a pH of 12.

At a pH of 12, the caustic scrubber is assumed to remove a fixed fraction of contaminants (per BARD Table 2.13-4 (pages 2.13-21 and 2.13-22)). There is no mention of how much less is removed if the pH is reduced below 12 to the amount required by the corrosion analysis. The results will increase the effluent flow rate, because of the reduction in efficiency. There is no indication in the BARD of the sensitivity of operations to changes in pH.

The engineering specification to the vendor (24590-LAW-3PS-MKAS-T0001, Rev 2, page 13) shows that Bechtel told the vendor that the scrubber must remove 97% of Sox gas “with the scrubber reagent “between pH9 and pH 14”. The vendor was told that the solution would or could be between pH of 9 and 14. This sheet also specifies that the vendor was supposed to provide the optimal range for pH. In addition, Acid conditions in the scrubber identified in the corrosion analysis (pH of 5) were not included in the specification provided to the vendor.

So – the Permit request package is internally inconsistent – stating that the design range is 5 to 10 in the corrosion evaluation, but ordering a system that can operate between pH of 9 and 14 (to be determined by the vendor), and using a flowsheet that assumes a pH of 12. The impact on operations is unknown (safety and quality indeterminate).

In addition, drawing 24590-QL-POA-MKAS-00003-04-00050 Rev 0E does not identify the material of construction for the internal structure and packing support in the scrubber. Nor does this drawing have a corrosion allowance for the packing support. Will it be durable under both the full range of caustic and acid flush conditions?

Also, the IQRPE Structural Integrity Assessment Report, 24590-CM-HC4-HXYG-000240-02-00013, Rev 0A relies on and references non-final design calculations for Stress Analysis and for Anchor Bolt and Embed design. Both of these are preliminary letter revision calculation. See page 5, for example. This problem has occurred in prior permit change proposals.

- DOE and Bechtel are also aware that:

Condition Report 24590-WTP-GCA-MGT-15-00813, dated 05-21-15 indicated that Bechtel did not understand the Vendor’s “finite element analysis.”

Condition Report 24590-WTP-GCA-MGT-15-00886, dated 06-09-15 indicated that Bechtel knew it did not have a supplier calculation checklist for the off-gas caustic scrubber process, and this was part of a Level A (PL-1) corrective action.

Condition Report 24590-WTP-GCA-MGT-15-00963, dated 06-17-15 indicated that Bechtel lacked documentation of the Caustic Scrubber Vendor’s design analysis software.

Condition Report 24590-WTP-GCA-MGT-15-01214, dated 07-29-15, indicated that Bechtel was aware of an attempt to change the operating conditions to reduce the pH, and “believed,” based on the basis of “we are told” that increasing the pH to 14 would be detrimental to

operating efficiency. This is without benefit of understanding the vendor software. No basis was provided.

Condition Report 24590-WTP-GCA-MGT-15-02162, dated 12-08-15, indicated a lack of basis for flow rates and vessel sizing, including for caustic scrubber operation.

- DOE and Bechtel are aware of Caustic Scrubber design problems identified in the recent draft LAW Design and Operability Report (factual accuracy is documented in the Record of Review forms), specifically:

Ammonium hydroxide could require removal or flushing (LOP/LVP-18)

There is no way to remove an accumulation of insoluble solids (LOP/LVP-44)

The effects from other unit operations on the startup and shutdown have not been fully analyzed (LOP/LVP-45)

There is no direct means to monitor the condition of the packing or mist eliminators within the caustic scrubber.

The design for removal/replacement for waste handling for the caustic scrubber is incomplete (LRWH-F-06-V-01).

In addition, a recent Commercial Grade Dedication (CGD) Audit Report, 15-QAD-0038, transmitted to Bechtel on August 6, 2015 specifically calls out findings associated with Premier Technologies (the caustic scrubber vendor) and the caustic scrubber itself. For example:

***“Review of Premier Technologies, Inc. Commercial Grade Dedication Procedure***

*The Premier Technologies, Inc. (PTI) CGD procedure, TP-3.4, Commercial Grade Dedication, Rev. 5, dated February 23, 2013, contained several instances in which the requirements of BNI specification 24590-WTP-3PS-G000-T0019 were not included in the procedure or, if included, were optional. Examples include:*

- *Technical evaluation*
- *Seismically or environmentally qualified items*
- *Method 1 misconceptions*
- *Method 2 misconceptions*
- *How to deal with other ASME certifications during CGD (PTI Quality Assurance Manual 1.3).*

*BNI did not identify this nonconformance and require correction of the condition by the supplier.*

**21. PTI Technologies [Premier Technology Inc.] – CGD 11-80 – ASME SA240, 316L (UNS S31603) Plate**

- *The PTI CGD Plan, No. 11-80, supporting Purchase Order 99896, for ASME SA240, 316L (UNS N10276) Plate did not provide sufficient evidence that the plate steal[sic], which was being used to fabricate the caustic scrubber vessel, head, and internals that*

*form the pressure vessel boundary could perform its safety function. The CGD plan and documentation of testing contained errors, specifically:*

- *The technical evaluation used the Boiler and Pressure Vessel Code (B&PVC) UNF-65 allowance to not perform brittle fracture testing; however, the technical evaluation did not discuss or contain the additional evaluation for suitability testing that is discussed in the UNF-65 allowance.”*

These examples show that the caustic scrubber is not ready for installation. DOE and Bechtel were aware of these problems before sending the permit change request to Ecology.

As a result the taxpayer will be paying to have it “fixed” in place later, or there will be pressure not to fix it at all.

### **TCO/SCR COMMENTS**

Note that the Thermal Catalytic Oxidizer/Selective Catalytic Reduction (TCO/SCR) has previously also been called the “SCO,” complicating searches for PIERS and Condition Reports.

- In 24590-CM-HC4-HXYG-00240-02-00012, Rev 0A, the IQRPE Assessment refers to a Rev “A” calculation as input in 4 places (pages 6, 7, 8, and 9). The calculation is 24590-LAW-MVC-LVP-00004, Rev. A, LVP-SKID-00002, *LAW Thermal Catalytic Oxidizer/Reducer, Stress Analysis with ANSYS*, including ECCN # 24590-LAW-MVE-LVP-00001. Rev “A” design documents are for conceptual design and are not suitable for final design or construction.
- In 24590-CM-HC4-HXYG-00240-02-00012, Rev 0A, the IQRPE Assessment refers to **24590-LAW-M4C-LOP-00001**, Rev. 3, *LAW Melter Offgas System Design Basis Flowsheets* including ECCN # 00003 and 00009 (page 10). However, the remainder of the change package, including the References for Data Sheet 24590-LAW-MKD-LVP-00012, Rev 12, refer to a different document **24590-LAW-M4E-LOP-00009**, with the same title: *LAW Melter Offgas System Design Basis Flow Sheets*. The results for NO<sub>x</sub> concentrations differ in these two calculations, but they have the same title. Neither flow sheet is provided in the permit change package. No dates are given for their publication.
- In 24590-CM-HC4-HXYG-00240-02-00012, Rev. 0A, the IQRPE Assessment refers to a Rev “C” calculation for hydrogen generation – 24590-WTP-M4C-V11T-00004, Rev. “C,” *Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP*. Again – a letter revision is not suitable for final design or construction.
- The TCO/SCR change package does not mention the DFLAW process or project. This project will change the feed to the LAW facility such that the concentrations of key components will be changed due to the elimination of additions and dilutions from the WTP pretreatment facility. Concentrations of organics and NO and NO<sub>2</sub> in the gas phase will likely change. As a result, the ability of the LAW TCO/SCR to treat the new concentrations and mass flows is unknown. Further, WTP contract Mod 353 to section H, establishes DOE-Directed waste acceptance criteria and design inputs, per letter 15-WTP-0023. Contract Mod 353 states that: “It is acknowledged by the parties that changes to these critical design inputs may materially impact the Contractor’s ability to

complete CLIN 2.1 and give rise to relief pursuant to the Changes clause of the contract.” DOE has therefore acknowledged that the non-design-basis quality inputs in letter 15-WTP-0023 may result in changes to the LAW facility, which includes the off-gas system and the LAW-TCO. And these changes are *expected* to produce rework.

- 24590-WTP-RPT-PT-005, Rev 7, *Flowsheet Bases, Assumptions, and Requirements Document* (BARD) is cited in the change package as a basis for the WTP RCRA Permit. However, this document itself refers to Revision A (Conceptual Design) information in several places. Nor does it address the changes from DFLAW. Further, the BARD contains only “expected” decontamination factors for the TCO (see page 3.3-16), and these are fixed values so changes in temperature, which affect the efficiency of the catalysts, are not accounted for in the flowsheet calculations (see page 3.3-40). Nor are the changes in the off-gas composition accounted for. The DFs are assumed to be 50 (reduction of 98% for NO and NO<sub>2</sub> no matter what the inputs are. This is an unverified assumption.

Further, Condition Report 24590-WTP-GCA-MGT-15-01819, dated 10-16-15, identified a lack of quality assurance requirements for scientific data, which includes many of the inputs to 24590-WTP-RPT-PT-005.

- Mechanical Data Sheet 24590-LAW-MKD-LVP-00012, Rev 15 (see page 11) relies on technical reports from off-gas emissions testing using simulants. However, there is no indication that these tests addressed the most challenging conditions per NQA-1 requirements, so the data used could be non-conservative. The relationship to DFLAW feeds is indeterminate.
- Mechanical Data Sheet 24590-LAW-MKD-LVP-00012, Rev 15 (see page 11) shows a change history for the engineering specification that has multiple changes including an unsupported statement that the changes do not affect the design margin (see page 4). Page 4 states that there was a decreased off-gas outlet design temperature, but the effect on the process margin (ability to react at least/more than 98% of the NO<sub>x</sub>) was not evaluated and no margin analysis was required. No margin analysis is available for DFLAW feeds. Reducing the catalyst temperature reduces the capacity and efficiency of the TCO.
- Project PIERS and Conditions Reports indicate multiple failures in the TCO design including an out-of-business vendor replaced with a “recovery vendor.” These reports include:

24590-WTP-CRPT-QA-08-623-C, dated 11-12-08, DOH Code Compliance, PDSA,

24590-WTP-PIER-MGT-09-1520-HLW-TCO, dated 10-08-09, - Quality Level (HLW TCO has the same function as in the LAW facility)

24590-WTP-PIER-MGT-11-1265-C, dated 12-13-11, Fatigue Assessment

24590-WTP-PIER-MGT-13-0024-C, dated 12-18-12, HLW-TCO PIER – Temperature Margin (HLW TCO has the same function as in the LAW facility)

24590-WTP-PIER-MGT-0351-C, dated 03-12-13, Clearance of the skid not adequate for Operations and Maintenance

24590-WTP-PIER-MGT-13-0511-C, dated 04-30-13, Permit Non-Compliance

24590-WTP-PIER-MGT-13-0662-C, dated 06-12-13, RVP Procurement Issues

24590-WTP-PIER-MGT-13-1528-B, dated 01-07-14, New Vendor – Issues with reusing the design from a failed vendor

24590-WTP-PIER-MGT-14-1452, date 07-09-15, Commercial Grade Dedication Issues for HLW TCO (same vendor as the LAW TCO)

24590-WTP-GCA-MGT-16-00030, dated 01-08-16, TCO Functional Test Plan Not Reviewed by Operations

There is no indication in the Permit package that these PIERS/Condition Reports have been resolved effectively, and the Bechtel Corrective Actions program is suspect, due to multiple prior failures, including multiple improper closures of corrective actions. Bechtel was aware of TCO issues before signing permit change request.

- The draft LAW Design and Operability Report contains recommendations for the LAW-TCO that have not been addressed, including:

*“An analysis of the thermal loading on the TCO skid should be performed to determine whether the materials of construction can accommodate the stresses imposed by the thermal cycling. Although considered unlikely, this analysis may result in redesign of Post CD-4 equipment.”*

*“Conduct analysis to determine the maximum flow increase that can be accommodated by the electric heater to remain above the catalyst operating temperature [this affects efficiency and ability to treat organics and NO<sub>x</sub>]. A new limit on flow rate increase may result.”*

*”The viability of the current TCO maintenance approach and associated throughput are indeterminate.”*

- The Commercial Grade Dedication Audit, 15-QAD-0038, found problems with the new LAW-TCO Vendor’s commercial grade dedication. Example results (there are more) include:

*“Review of the commercial grade survey report and checklist for IONEX (24590-WTP-SSVMATL-13-007, Commercial Grade Survey Report, IONEX Research Corporation, Lafayette, Colorado, Rev. 0) in support of the low-activity waste thermal catalytic oxidizer (TCO)/reducer skid and ammonia skid identified instances in which the documented expectation was not met yet the item was marked as satisfactory. An explanation was not provided as to why the line-of-inquiry (LOI) was satisfactory even though the requirements were not met.”*

*“The CGD plan for the Low-Activity Waste Catalytic Oxidizer/Reducer Skid and Ammonia Dilution Skid assembly did not document, through the technical evaluation, the critical characteristics representing those characteristics of the item that supported the ability of the host equipment to perform the required safety functions during and after a design basis accident. Additionally, the individual CGD plans for the components of the skid did not address the need for system performance to meet the safety function during and after a seismic event.”*

- A DOE-HQ review of the LAW Hazards Analysis (15-TRS-0017, August 26, 2015) found aspects of the Hazards Analysis inadequate, including inappropriate, or misclassified candidate hazard controls for the ammonia system. (Ammonia is a reagent used in the LAW-TCO).
- A draft DOE-OIG assessment of the WTP Corrective Action Program concluded (06-03-15) “it is too early to draw conclusions on the efficacy of the corrective actions taken and underway.” Therefore, changes to the designs as a result of the findings may not be effective themselves. The IG found that DOE “did not ensure that previous Bechtel initiatives to address corrective action program implementation problems were fully implemented or sustained.”

#### **LAW HEPA PREHEATER COMMENTS**

- The LAW HEPA Preheater IQRPE report continues to rely on a letter revision pipe stress calculation that is not a final design. 24590-CM-HC\$-HXYG-00240-01-00010, Rev 0A refers to 24590-LAW-P6C-LOP-10016, Rev. E, *Pipe Stress Analysis for LOP System (Design Calculation)*. Letter revisions are not final design documents.
- The LAW HEPA Preheaters are upstream of the TCO/SCR, so they are exposed to untreated and lethal concentrations of NO<sub>x</sub> (many times the concentration that is immediately dangerous to life and health). See the BARD, 24590-WTP-RPT-PT-02-005, Rev. 7, Figure 1.2-3, Page 1.2-7.

Drawing 24590-CD-POA-MEE0-00003-03-00004, “Immersion Heater Flanged” identifies the heated medium as air with “no lethal substances” instead of a process toxic off-gas. See sheet 1. Sheet 3 of this drawing shows the number of commercial grade material specifications. The absence of a commercial grade dedication report in the permit package is contrary to the requirement that a final permit contain a *description of procedures, structures, or equipment used at the facility to prevent undue exposure of personnel to dangerous waste, and prevent releases to the atmosphere*. Without a commercial grade dedication report, the features needed in the heater to prevent releases to the workers cannot be verified as effective.

#### **VIII. The Certification Statements are Open to Question**

The managers of Bechtel National Inc. and DOE-Office of River Protection are required by WAC-173-303-810 to sign a certification that states:

*“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel gather the[sic] and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”*

What standard does Ecology use for evaluating the value and truthfulness of these signatures?

## **IX. In Conclusion**

The LAW TCO/SCR, Caustic Scrubber and HEPA Preheaters should not be installed.

The Pretreatment DW Permit should be revoked.

Further construction should stop.

No further WTP Permit revisions should be made until there is a final DFLAW, LAWPS and EMF integrated design. Ecology’s decision to use a phased approach for permitting should be revoked.

An independent multidisciplinary quality assurance and process audit should be conducted on any future WTP permit proposal prior to public review.

Already installed equipment should be revisited to verify the status of open quality and safety problems. A 100% integrated extent of condition is warranted.

If this can’t be done, Ecology should consider closing the tank farms as a landfill, with void space fill and water intrusion covers. After all, DOE has proven that the “urgent” risk from the waste isn’t really urgent, since their design basis for LAWPS is to put the cesium-137 right back in the tanks. The “urgent” HLW risk isn’t urgent since DOE has proposed delaying HLW treatment from 2007 to 2039 (32 years).

Looking to the future, care should be taken in reviewing the DFLAW design. In Section B of the WTP contract, DOE offers a \$9 million incentive fee including \$100,000 a month for every month that the design is completed ahead of April 30, 2018. This is an incentive to cut corners, and to resist making genuine corrections.

Prior experience is that DOE has readily paid fee for hastily completed work that was incomplete. Schedule was met, fees were paid, and the products were sent back for rework. Examples include fee paid for defective vessels; fee paid for resolving the “M3” mixing issue; and \$4.5 million fee paid for reducing sodium addition in Pretreatment – apparently a reward because PT is failed so can’t add any sodium. Fee was paid in spite of the statement by DOE that the sodium reduction milestone was “of no value to the government.” (See Item 9 of CCN-269659.)

It is time to stop repeating the same actions, incentives, and permit changes that perpetuate the failures and promote needless risk at facility startup.

**From:** Mike <[mikeconlan@hotmail.com](mailto:mikeconlan@hotmail.com)>

**Date:** December 23, 2015 at 3:33:19 PM PST

**To:** "Hanford (ECY)" <[hanford@ECY.WA.GOV](mailto:hanford@ECY.WA.GOV)>

**Subject:** Ecology proposed changes to WTP design

Dieter Bohrmann:

- 1) Remove all nuclear waste,
- 2) Do not allow anymore nuclear waste into the facility,
- 3) Replace all the single storage tanks,
- 4) Stop all the nuclear leakage entering the Columbia River.

Mike Conlan

Redmond WA

January 11, 2016

JAN 12 2016

DEPARTMENT OF ECOLOGY  
NWP - RICHLAND

Dieter Bohrmann  
Washington Department of Ecology  
3100 Port of Benton Boulevard  
Richland, WA 99354

**COPY**  
**Review & Recycle**

Dear Mr. Bohrmann:

This letter provides comments in response to the Department of Ecology's invitation for public review of proposed modifications to the Hanford Dangerous Waste (RCRA) Permit, specific to the Waste Treatment and Immobilization Plant (WTP)<sup>1</sup>.

The proposed changes to the Dangerous Waste Permit are intended to allow continued construction of the Low Activity Waste (LAW) Vitrification Facility, in particular the Off-Gas System. The DOE-Bechtel partnership proposes to install Thermal Catalytic Oxidizer/Selective Catalytic Reduction (TCO/SCR) equipment, the LAW Caustic Scrubber, and the LAW HEPA Preheaters.

Relevant requirements associated with this change proposal are:

- **Permit Application Requirements.** WAC-173-303-803(4)(a) states for New TSD facilities: "Except as provided in 40 C.F.R. 270.10 (f)(3) for TSCA facilities [PCB Incinerator], *no person may begin physical construction of a new TSD facility without having submitted parts A and B of the permit application and having received a finally effective final facility permit.*" WTP is not a TSCA Facility. WAC-173-303-803(4)(b) further states that applications are required to be submitted at least 180 days before physical construction is expected to begin.
- **Final Facility Permits.** WAC-173-303-806 defines the contents of a final facility permit, which must include:

*A description of procedures, structures, or equipment used at the facility to:*  
*Mitigate effects of equipment failure and power outages,*  
*Prevent undue exposure of personnel to dangerous waste, and*  
*Prevent releases to the atmosphere.*

Also:

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<sup>1</sup> Department of Ecology Publication 15-05-015, dated December 28, 2015, located at <https://fortress.wa.gov/ecy/publications/documents/1505015.pdf>.

*The owner/operator must demonstrate that the facility can and will be designed to resist seismic ground motion and that the design is sufficient to withstand the maximum horizontal acceleration of a design earthquake specified in the demonstration.*

Also:

*A detailed description of the unit being used or proposed for use, including the following:  
Physical characteristics, materials of construction, and dimensions of the unit;  
Detailed plans and engineering reports describing how the unit will be located, designed, constructed, operated, maintained, monitored, inspected, and closed to comply with the requirements of WAC 173-303-680 (2) and (3);*

- **Permit Conditions<sup>2</sup>** as provided in Ecology's public review package, which include requirements for submittal of:

*Mass and energy balance for normal projected operating conditions used in developing the Piping and Instrumentation Diagrams and the Process Flow Diagrams, including assumptions and formulas used to complete the mass and energy balance, so that they can be independently verified for incorporation into the Administrative Record. [See, for example: III.10.E.9.c.viii, III.10.E.9.d.xi, III.10.G.10.c.viii, III.10.G.10.d.xi, and III.10.H.5.c.viii.]*

*Design criteria (references to codes and standards, load definitions, and load combinations, materials of construction, and analysis/design methodology) and typical design details for the support of the equipment... Documentation will include but not limited to, supporting specifications, test data, treatment effectiveness report, etc. supporting projected operational capability (e.g., WESP projected removal efficiency for individual metals, halogens, particulates, etc.) and compliance with performance standards specified in Permit Condition. [See, for example: III.10.H.5.c.iii, III.10.H.5.d.iii]*

A review of the proposed permit modifications and documentation and the relevant requirements shows clearly that:

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<sup>2</sup> WA7890008967 Group 10 WTP Permit Conditions provided for Public Review. Located at: [http://www.ecy.wa.gov/programs/nwp/PI/pdf/comment\\_periods/8c\\_2015\\_2D/files/Conditions.pdf](http://www.ecy.wa.gov/programs/nwp/PI/pdf/comment_periods/8c_2015_2D/files/Conditions.pdf)

## I. Pretreatment is the Only Permitted Source of Feed to the LAW Facility

In every document submitted for the DW Permit, the basis for feed to the LAW Facility is the WTP Pretreatment facility.

The permit change package ignores new projects that will alter the feed and operation of the LAW Facility.

DOE and Ecology have acknowledged in court filings that the WTP Pretreatment Facility has failures that will result in design and process changes. For example, the DOE proposal of March 31, 2014 to amend the consent decree<sup>3</sup>, states: *"the overwhelming technical judgment is that the WTP cannot operate under the current design, and therefore a new approach is needed."* And: *"It has become clear...that unresolved technical issues could prevent the Pretreatment Facility from operating safely as currently designed."*

The DOE proposal of March 31, 2014 includes "re-work" facilities planned in order to implement a "backfit" to a different feed process in response to the WTP design failure. These include Direct Feed Law Vitrification, (DFLAW) and a tank farm LAW Pretreatment System, (LAWPS), and a new end process Effluent Management Facility (EMF) which are new designs currently in the conceptual design phase. EMF is needed to manage wastewater that was previously routed to the WTP Pretreatment facility.

In spite of the admitted design failures in Pretreatment, the Chapter 4.0 Process Information<sup>4</sup> located in the Permit Change Package does not contain any reference to DFLAW, LAWPS, or EMF. Instead it states that WTP will receive feed from the tank farms meeting envelope specifications A, B, C, and D, and "the waste feed will be stored and subsequently treated in the pretreatment facility prior to vitrification." The process information is therefore no longer valid.

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<sup>3</sup> Proposal by the U.S. Department of Energy to the State of Washington to Amend the Consent Decree. Located at: [http://energy.gov/sites/prod/files/2014/03/f14/Proposal%203-31%20FINAL\\_0.pdf](http://energy.gov/sites/prod/files/2014/03/f14/Proposal%203-31%20FINAL_0.pdf)

<sup>4</sup> WA7890008967, Waste Treatment and Immobilization Plant, *Chapter 4.0 Process Information*. Located at: [http://www.ecy.wa.gov/programs/nwp/PI/pdf/comment\\_periods/8c\\_2015\\_2D/files/Ch4\\_Process\\_Info.pdf](http://www.ecy.wa.gov/programs/nwp/PI/pdf/comment_periods/8c_2015_2D/files/Ch4_Process_Info.pdf)

## II. The Pretreatment Permit Should be Cancelled

DOE has proposed that Pretreatment cannot be corrected and started until December 31, 2039. As a result, the Pretreatment portion of the RCRA/Dangerous Waste Permit (DWP) should be rescinded, because the technical information in the permit is not valid. DOE's Brief to the District Court on November 13, 2015 stated: "...*redesigning these facilities [Pretreatment and High Level Waste] in response to technical issue resolution may require altering designs for equipment, components, or processes...*" And DOE is not planning to have a redesigned and verified Pretreatment Facility Design until on or after December 31, 2024, according to DOE's proposed order, also dated November 13, 2015.

Pretreatment has multiple documented failures. Design changes through 2024 are expected.

Despite knowing that the Pretreatment portion of the Permit has "*a lot of information that is out-of-date; like for example the P&IDs,*" DOE and Ecology agreed they were both "reluctant" to put a hold on the entire Pretreatment Facility in the Permit (see Section 5 of CCN-280037<sup>5</sup>). The unsupported agreement is contrary to the WAC-173-303-803(4)(a) and WAC-173-303-806 requirements for a final, effective permit, prior to construction. A valid basis was not given for the agreed decision to maintain the obsolete PT Permit.

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<sup>5</sup> CCN-280037, *Meeting Minutes, June 25, 2015 DWP Integration Meeting.*

### III. Feed Using the New Facilities has not been Analyzed

The DFLAW early start retrofit process does not have a valid feed specification. This is documented in WTP Contract Modification 350, which is dated June 11, 2015. The "TBD" entry for DFLAW feed (Envelope E) is still in the current contract statement of work<sup>6</sup>. This statement of work shows DOE will only comment on and not approve the new TBD feed specification for "Envelope E". This is a more lax approach than was used for the original feed specifications.

The DFLAW Feed has not been analyzed. DOE/Bechtel do not know if DFLAW is sized properly or if it will be durable or operate properly

While DOE has released a hold on the basis of design document for including DFLAW, the accepted status is that "there is no single design document that bounds the design limits of the DFLAW configuration, *except those in place between PT and LAW.*" "When Envelope E is clearly defined in the contract, a *future* BODCN can address it." See the attachment to 15-WTP-0186<sup>7</sup>.

Note that 15-WTP-0187 also commits to creating design limits using a combination of ICD-30 (DFLAW Feed Interface, which also has TBDs) and the Process Inputs Basis of Design (PIBOD) calculation (WTP-DB-PET-09-001). The PIBOD calculation depends on Pretreatment for calculating the LAW Feed and so is not relevant to DFLAW. This approach is fraught with QA problems and will be forced to use assumptions that will be difficult, if not impossible, to verify. DFLAW starts with cesium removal in the tank farms. It will not have the same sodium additions for aluminum solubility and it will not have the same vessel washes or flushes or other chemical additions or recycles, as would occur in Pretreatment.

The above is contrary to the permit conditions that require valid design criteria and a valid mass and energy balance for a final effective permit.

Continued installation of the TCO/SCR, Caustic Scrubber, HEPA Preheaters, or any LAW equipment in the absence of a feed specification, proper design requirements, and proper design-basis mass balance, is contrary to WAC-173-303-806 and represents a fraud on the public, perpetrated at the expense of safety.

<sup>6</sup> Contract No. DE-AC27-01RV14136, *Section C Statement of Work*, Pages C-21 and C-92. Located at [http://www.hanford.gov/files.cfm/WTP\\_M-2\\_WTP\\_Contract\\_Section\\_C\\_-\\_Conformed\\_Thru\\_3541.pdf](http://www.hanford.gov/files.cfm/WTP_M-2_WTP_Contract_Section_C_-_Conformed_Thru_3541.pdf).

<sup>7</sup> 15-WTP-0186, Contract No. DE-AC27-01RV14136 – *Release of Hold Placed on 24590-WTP-BODCN-ENG-15-0016, Updates to Include Direct Feed Low-Activity Waste Content*, dated November 34, 2015.

#### IV. The DW Permit Lacks a Valid Mass and Energy Balance

The Statement of Basis<sup>8</sup> provided by Ecology for the public review period identifies the Mass and Energy Balance for the WTP Permit, including the following in association with Permit Condition III.10.H.5.c.viii.

*Flowsheet Bases, Assumptions, and Requirements*, 24590-WTP-RPT-PT-02-005, Rev 7, dated May 30, 2013.

<http://pdw.hanford.gov/arpir/pdf.cfm?accession=0079066H>.

*2010 WTP Material Balance and Steady State Flowsheet Assessment, Deliverable 2.7*, 24590-WTP-RPT-PET-10-022, Rev 0, dated December 12, 2010, and

*Steady State (AES) Model Run Report for 2010 Material Balance and Process Flowsheet Analysis Assessment Report*, 24590-WTP-MRR-PET-10-010, Rev 0, dated December 6, 2010.

None of these three documents addresses the mass, energy, or applicability of flowsheet basis technology development limits associated with Direct Feed LAW from the LAW Pretreatment System. They all rely on or describe feed from the (failed and outdated) Pretreatment facility. Flowsheet Deliverable 2.7 and the associated Steady State Model (AES) were eliminated from the WTP Contract and are no longer valid tools. As a result, Deliverable 2.7 for the steady state mass balance is absent from the current contract Statement of Work<sup>9</sup>. The mass balance documents were also produced earlier than the most recent version of the *Flowsheet Bases, Assumptions, and Requirements* document (BARD).

The DW Permit Mass and Energy Balances are outdated and do not address the new LAW Pretreatment System, DFLAW, or the new Effluent Management Facility.

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<sup>8</sup> Department of Ecology *Statement of Basis for Proposed Permit Modification of the Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit Group 10, Waste Treatment and Immobilization Plant, WA7890008967*. Located at: [http://www.ecy.wa.gov/programs/nwp/PI/pdf/comment\\_periods/8c\\_2015\\_2D/files/SoB.pdf](http://www.ecy.wa.gov/programs/nwp/PI/pdf/comment_periods/8c_2015_2D/files/SoB.pdf).

<sup>9</sup> Contract No. DE-AC27-01RV14136, *Section C Statement of Work*. Located at [http://www.hanford.gov/files.cfm/WTP\\_M-2\\_WTP\\_Contract\\_Section\\_C\\_-\\_Conformed\\_Thru\\_3541.pdf](http://www.hanford.gov/files.cfm/WTP_M-2_WTP_Contract_Section_C_-_Conformed_Thru_3541.pdf)

Contrary to this testimony, the Design Review Plan, 14-WTP-0042<sup>15</sup>, states this was a partial review of only some of the systems.

Other unresolved problems with the LAW Facility include:

- The Hazards Analysis is not complete. – DOE in letter 15-TRS-0026<sup>16</sup> notes that “the proposed control strategy for offgas events is underdeveloped and does not demonstrate adequate protection of the facility worker in the event of an offgas system release to normally occupied areas.” This letter cites ammonia and carbon dioxide as potential hazards. Ammonia is a process chemical used in the LAW TCO/SCR.

Further, DOE letter 15-TRS-0029<sup>17</sup> approves a delay for the submittal of the LAW Facility Hazards Analysis and Preliminary Documented Safety Analysis (PDSA) change package until March 2016. It will require some time after that to complete the review and approval process. New safety structures, systems, and components for the LAW facility are expected to be proposed. Integration of safety in the design is incomplete.

As a result, WAC-173-303-806 effective final facility permit required contents are incomplete for the description of procedures, structures, or equipment used at the facility to mitigate effects of equipment failure and power outages, prevent undue exposure of personnel to dangerous waste, and prevent releases to the atmosphere.

- A 2015 Consent Order<sup>18</sup> written by the DOE Office of Enforcement and signed by Bechtel included an \$800,000 fine associated with long-term safety integration and quality failures.

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<sup>15</sup> 14-WTP-0042, Letter, *Contract No. DE-AC27-01RV14136 – Low Activity Waste Facility Design Review Plan*, dated March 12, 2014.

<sup>16</sup> 15-TRS-0026, Contract No. DE-AC27-01RV14136, *The U.S. Department of Energy Office of River Protection Review of Low-Activity Waste Facility Confinement Functional Classification Strategy Report*, dated December 21, 2015.

<sup>17</sup> 15-TRS-0029, Contract No. DE-AC27-01RV14136 – *Approval of Extension Request for Bechtel National, Inc. Response to the U.S. Department of Energy, Office of River Protection Safety Basis Review Team Comments on 24590-LAW-HAR-NS-13-001-01, Hazards Analysis Report for the Low Activity Waste Facility, Volume 5, Melter Offgas System, Rev. 0*, dated December 1, 2015.

<sup>18</sup> *Consent Order NCO-2015-02*, dated June 1, 2015. Located at: <http://energy.gov/sites/prod/files/2015/06/f23/BNI%20Signed%20Consent%20Order%20%28NCO-2015-02%29.pdf>

## V. The LAW Design has Unresolved Problems

The DOE-Bechtel Partnership is aware of significant vulnerabilities as documented in a partial LAW Design and Operability Review (Pre-Decisional Draft<sup>12</sup>) and elsewhere but has not resolved them.

In addition to the LAW Design and Operability (D&O) Report, DOE has not completed a review of the remaining 13 interfacing LAW systems, which can impact equipment subject to the DW Permit. Contrary to testimony<sup>13</sup> by DOE officials to the DNFSB on August 26, 2015, the LAW D&O Review was not a self-identified confirmation that all problems have been identified.

Quality, Operability, and Safety Failures are Not Resolved and the Full Extent of Condition is Not Known. These problems affect permit conditions.

DOE Officials testified to the DNFSB on August 26, 2015:

*"It was a draft report that we commissioned ourselves..."*

*"to drive and identify all of the physical possible issues left to go and turn up all the rocks and question everything more than once"*

*"less than five percent of what is in that report is what we call new material"*

Contrary to this testimony, the LAW Design and Operability report was not commissioned by ORP, but was directed by the Chief of Nuclear Safety, in a letter dated January 28, 2014<sup>14</sup>, as a result of an external construction project review.

<sup>12</sup> Predecisional Draft *WTP Low-Activity Waste Facility Design and Operability Review and Recommendations*, Dated 2014. Located at: <https://dl.dropboxusercontent.com/u/57280376/WTP/2014%20LAW%20Design%20and%20Operational%20Review%20Report.pdf>.

<sup>13</sup> Transcript, Defense Nuclear Facilities Safety Board Public Meeting and Hearing, August 26, 2015. Located at: [http://www.dnfsb.gov/sites/default/files/Board%20Activities/Public%20Hearings/Improving%20Safety%20Culture%20at%20the%20Waste%20Treatment%20&%20Immobilization%20Plant%20\(WTP\)%20Public%20Hearing/Transcripts/phtr\\_28286.pdf](http://www.dnfsb.gov/sites/default/files/Board%20Activities/Public%20Hearings/Improving%20Safety%20Culture%20at%20the%20Waste%20Treatment%20&%20Immobilization%20Plant%20(WTP)%20Public%20Hearing/Transcripts/phtr_28286.pdf).

<sup>14</sup> Letter, R.H. Lagdon Jr. to Daniel B. Poneman, *Letter Report on the Construction Project Review of the Low-Activity Waste Facility, Balance of Facilities, and Analytical Laboratory at the Waste Treatment and Immobilization Plant Project*, dated January 28, 2014.

not know what other chemical adjustments and costs might be needed in the LAWPS pretreatment facility to account for other chemical changes caused by the now absent Pretreatment Unit Operations. DOE does not know the consequences of feeding the LAW Facility directly from tank farms without adjustment, as is planned.

If DOE does not adjust the LAWPS so that it matches the changes that would have been made in Pretreatment, then the LAW equipment is vulnerable to unknowns, including elevated ratios of corrosion causing compounds (chlorides and fluorides) to sodium, increased concentrations of acid gasses (SOx) and increased NOx flows for which the equipment was not designed. These changes are required to be subject to NQA-1 change control and configuration management processes, and must be analyzed before the design can be considered complete. To issue a permit and allow construction is not supported by the available data. If the thermal catalytic oxidizer is installed, it will be an irreversible action, as the roof will then be placed on the LAW facility, and there is no provision to replace the unit.

DFLAW is a retrofit process – it is a change process that requires careful analysis of the consequences of fundamental changes in input.

In addition, the new EMF facility depends on the operation of the upstream, unverified, LAW equipment. The flows in the submerged bed scrubber and the WESP impact the flow rate and composition in the EMF.

And EMF too is not reflected in the DW Permit Process Flow Diagrams or design basis mass balance. And Bechtel has cancelled the steady state flow sheet cited in the permit conditions, and DOE has removed it from the contract.

EMF calculations are not at the final design state – yet the calculations even go so far as to say there are “no assumptions.” This is a red flag that calls for a process and QA audit of the EMF design basis and the WTP mass and energy balances. Scoping evaluations using the tank farms HTWOS model are not valid as a validated and verified software tool for WTP design.

DOE will claim that the review of the impact of changing the feed process can “wait until commissioning.” This is not so. You cannot wait to analyze the changes until commissioning. First, the installations will be irreversible, so there will be difficulty in replacing any non-usable or wrong-sized equipment. Second, commissioning will create lethal chemical hazards even if a non-radioactive simulant is used. Nitrates are a big part of the waste and they are converted to lethal NOx gas in the melter, even when the simulant is not radioactive. To postpone discovery of problems until commissioning is a fraudulent activity that is contrary to the Quality Assurance requirements of NQA-1 and to the requirements for integrating safety into the design (DOE-STD-1189). It also represents a corrupt means to achieve more rework, which is the primary product of this project.

The Steady State Model further does not address the range of normal and expected operating conditions. The Steady State model was noted in 2009 as applying to only a small fraction of waste batches, according to an External Technical Review Team<sup>10</sup>. Therefore it cannot project the range of normal operating conditions or establish nominal conditions (arising from the variety of individual feeds), as required in Permit Condition III.10.H.5.c.viii. It is out of date, uses the wrong unit operations, and is limited in scope. In addition, there is no tie to data tables in the Process Flow Diagrams (PFDs), which, contrary to best industry practice, have no data tables to show temperatures, pressures, pH, flow rates, or components of interest. This differs from other PFDs in the permit (such as for ETF).

The DOE-Bechtel Partnership plans to operate the LAW facility with feed from a new project (LAWPS) and to treat the resulting effluent using another new effluent management facility (EMF) instead of having a recycle to Pretreatment. LAWPS and EMF are new designs that are not incorporated in the DW Permit Process Flow Diagrams (PFDs) or in the WTP design basis mass balances (known as APPS/PIBOD and WEBPPS).

The DFLAW Retrofit, LAWPS, and EMF facilities are all in the conceptual design stage. These efforts so far are not using properly verified and validated software or appropriate design calculations, and they are not identifying assumptions requiring verification.

For example, a recent calculation (see RPP-RPT-59001) for a source term estimate for the EMF states that it contains “no assumptions.” This calculation is in addition based on the *not-to-be-used for design* HTWOS model. This calculation cannot accurately model EMF because there is no design-basis feed to DFLAW and HTWOS is not design quality software for WTP. So, despite the claim, there are unstated assumptions. The calculation therefore has no indication of the assumptions that require validation in order to be used for a design analysis.

The Hanford Tank Waste Operations Simulator (HTWOS) model is not validated for design use per NQA-1. The HTWOS model design document calls out clearly that HTWOS is a non-safety, non-quality affecting software application that is “not used in design activities.” See RPP-50816<sup>11</sup> Pages 9 and D-9.

DOE does not know if the LAWPS project will have to add sodium to the tank waste in order to provide feed that would be the same as feed that would have come from the Pretreatment Facility. The failed Pretreatment flowsheet added sodium to leach aluminum and to keep aluminum in solution and prevent precipitation. Pretreatment also added other chemicals due to operations associated with acid recovery, tank flushes and acid cleaning, etc. DOE does

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<sup>10</sup> *External Technical Review for Evaluation of System Level Modeling and Simulation Tools in Support of Hanford Site Liquid Waste Process*, Regalbuto, et. al., dated September 2009. Located at: <http://energy.gov/sites/prod/files/em/ORPETRFinalReport9302009.pdf>.

<sup>11</sup> RPP-50816, *Software Management Plan for Grade D Custom Developed Hanford Tank Waste Operations Simulator (HTWOS)*, Rev 1, dated September 12, 2013.

- The DOE Office of Inspector General found profound procurement and quality problems in Audit Report DOE-OIG-16-03<sup>19</sup>. This report notes that, while Bechtel is using a Managed Improvement Plan (MIP), “Office of River Protection officials noted that Bechtel has initiated corrective actions in the past only to have the issues reappear over time.” The auditor’s comments included: “we disagree with management’s comment that the report did not identify any issues that had not been previously identified by either the Department or Bechtel. Our report acknowledges the issues identified by the Department and Bechtel. However, several new issues we identified in this report include the following: (1) the magnitude of the issue with nonconforming parts and material, (2) the Office of River Protection’s ineffective oversight over Bechtel’s backcharging practices, and (3) Bechtel’s problems resolving root causes of these issues.”

Quality defects in the procured equipment affect the safety function and show the need for detailed process and QA audits of the LAW equipment as applied to DFLAW feeds before a permit can be considered final and effective. While Bechtel is “in the process” of implementing corrective actions – those actions are not verified complete and do not address DFLAW interfaces. NQA-1 does not allow closing a corrective action to a promise for a future activity.

- Even now, the DOE Office of Inspector General is about to publish a delayed report titled “*Corrective Action Program at the Waste Treatment and Immobilization Plant.*” The review draft was dated June 3, 2015. The draft concluded that “the WTP corrective action program was not fully effective in managing and resolving issues.” Reliance cannot be made on *promises* or plans for corrections in the LAW facility as a result. While comments were transmitted in September 2015, the report is not yet issued, in spite of the OIG’s commitment to release such reports within 60 days after receiving management comments. Additional examples of failures in the Corrective Actions Management System are documented in Project Condition Reports, which have detected problems such as inadequate closure of corrective actions, inadequate tracking of condition reports, and corrective action management software failures. Movement of condition reports from one facility to another (“shell game”) has also hampered issue tracking. Inconsistent labeling of systems (as noted in the LAW D&O report) makes it difficult to search or identify the full set of condition reports for equipment.
- DOE issued an Audit of Commercial Grade Dedication<sup>20</sup> in August of 2015. Commercial Grade Dedication (CGD) is used to verify that the design meets its requirements and the

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<sup>19</sup> DOE-OIG-16-03, *Audit Report – Procurement of Parts and Materials for the Waste Treatment and Immobilization Plant at the Hanford Site*, dated November 2015. Located at: <http://energy.gov/sites/prod/files/2015/11/f27/DOE-OIG-16-03.pdf>

<sup>20</sup> 15-QAD-0038, Letter, Contract No. DE-AC27-01RVI4136 – *Audit Report U-14-QAD-RPPWTP-003 – U.S. Department of Energy, Office of River Protection Audit of Bechtel National, Inc. Commercial Grade Dedication Program*, dated August 6, 2015.

equipment will perform its function. Specifically, when equipment has an assembly or component part that is a commercial grade item, NQA-1 requires that the characteristics of the item to be verified for acceptance and the acceptance criteria for those characteristics shall be documented. DOE's audit identified multiple CGD failures, including for LAW equipment and LAW Vendors associated with the current permit change request. Bechtel issued a "Level A" Condition Report, which is the most serious level of finding. Further, this is a repeat issue from a previous consent order and \$170,000 fine, NCO-2010-03<sup>21</sup>. Persistent CGD issues and failure to show the equipment will perform its functions are not addressed in the Permit and the findings are not closed.

A "Final" Permit for any portion of the LAW Facility cannot possibly be called "complete" at this time. Final designs are needed to ensure verification of unverified assumptions, proper integration with upstream and downstream equipment, and resolution of indeterminate quality work.

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<sup>21</sup> NCO-2010-03, Commercial Grade Dedication Consent Order, dated September 13, 2010. Located at: [http://energy.gov/sites/prod/files/hss/Enforcement%20and%20Oversight/Enforcement/docs/consentorders/BNI Consent Order %28NCO-2010-03%29.pdf](http://energy.gov/sites/prod/files/hss/Enforcement%20and%20Oversight/Enforcement/docs/consentorders/BNI%20Consent%20Order%28NCO-2010-03%29.pdf).

## VI. Ecology Has Violated WAC-173-303-803(4)(a)

As shown above, the information necessary for a final, effective permit as required by WAC-173-303-803(4)(a) does not exist.

Of note is that Ecology has responded to previous comments by referring to a previous decision to make an exception to this requirement. Ecology's previous decision is no longer valid, as shown below.

Ecology has allowed construction before having a Final/Effective Permit. Ecology's decision to allow a phased approach to permitting is not valid.
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Ecology's response to comments in Publication 14-05-004<sup>22</sup> referred to a Fact Sheet, (Ecology Publication 01-05-005, dated September 2002) to describe the "phased permitting approach" approved by Ecology in 2002 for the WTP permit. This phased approach allowed DOE and Bechtel to submit design information into the permit and to continue construction before a complete design was available. This has been contrary to WAC-173-303-803(4)(a) for a period of more than 13 years.

Ecology's Publications Web Page for publications<sup>23</sup> shows that the fact sheet from September 2002 is actually Publication 01-05-006<sup>24</sup>.

The 2002 Fact Sheet states the basis for Ecology's decision to ignore the requirement for final design before construction was schedule pressure: *"The amount of time it would take to complete the detailed design and follow a traditional permitting process would delay construction up to four years."* But many more than 4 years have passed. If construction had

<sup>22</sup> Department of Ecology Publication 14-05-004, *Response to Comments Modification of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit Group 10 (WA7890008967) Waste Treatment and Immobilization Plant October 15 – December 20, 2013*, dated March 2014. Located at: <https://fortress.wa.gov/ecy/publications/documents/1405004.pdf>

<sup>23</sup> Department of Ecology Nuclear Waste Program Publications. Located at: <https://fortress.wa.gov/ecy/publications/UIPages/PublicationList.aspx?IndexTypeName=Program&NameValue=Nuclear+Waste&DocumentTypeName=Publication&yearDate=2002>

<sup>24</sup> Department of Ecology Publication 01-05-006, Fact Sheet for the Hanford Facility Resource Conservation and Recovery Act Draft Permit for the Treatment, Storage, and Disposal of Dangerous Waste, dated September, 2002. Located at: <https://fortress.wa.gov/ecy/publications/documents/0105006.pdf>

been delayed to wait for a final, integrated design, much time and billions of dollars could have been saved. Instead, this failed decision has contributed to a stove-piped cycle of endless rework.

Nor has the risk reduction anticipated in Publication 01-05-006 occurred. There will be no “*treatment through vitrification, of at least 10% of the tank waste by volume and 25% by radioactivity by 2018.*” Indeed – the current DFLAW process just dumps removed cesium-137 back into the tanks.

In publication 01-05-006, Ecology relied on Bechtel’s claims of success with fast track design-build for other projects as a basis: “*The Bechtel Group, including BNI, has successfully used the close coupled EPC process for decades to design and construct major capital projects across the industrial sectors Bechtel supports.*” However no specific nuclear success examples were cited and no such success has occurred as promised at WTP.

Ecology was not alone in approving fast track construction before final design. DOE also approved a fast track design-build approach where construction is allowed without having a final design for all interfacing equipment and systems (stove-piped approach) in 2003, but recently and clearly rejected that as a good decision (in addition to the prohibition already contained in DOE Order 413.3B). The Secretary of Energy issued a letter on December 1, 2014, with an attached Report of the Contract and Project Management Working Group<sup>25</sup>. This report states in the Section 5.4.4 Case Study of WTP that “*The use of a fast track approach for first of a kind nuclear plant consisting of multiple nuclear facilities was a bad acquisition approach. It is the primary factor for the significant cost increases and schedule delays that have ensued over the years. There continues to be significant performance risk associated with this project.*”

Further, the Secretary of Energy elaborated<sup>26</sup> on June 8, 2015 that before achieving Critical Decision 2, which precedes construction, nuclear construction projects are required to have a 90 percent final design completed (for the whole project). And this letter includes a definition of 90 percent final design and required documents ahead of construction to mean:

- Complete final drawings and specifications that may be released for bid and/or construction
- A current and detailed cost estimate
- A current construction schedule
- Clearly defined testing requirements and acceptance criteria for the safety and functionality of all subsystems

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<sup>25</sup> Letter, Ernest J. Moniz, *Improving the Department's Management of Projects*, dated December 1, 2014.

<sup>26</sup> Letter, Ernest J. Moniz, *Project Management Policies and Principles*, dated June 8, 2015.

- Independent technical, construction, operation and environmental reviews of the final drawings and specifications
- A quality control review that evaluates both technical accuracy and discipline coordination
- A final design that meets all the requirements stipulated in the Code of Record
- A final design review that should be merely be a final validation of comment resolution from previous reviews and a review of any additional developments since the last review
- The checking and verification of any required waivers or exemptions
- Final design report
- Final design review report
- Preliminary documented safety analysis
- Safety evaluation report

No such set of information is available for the LAW facility, the DFLAW retrofit project, the LAWPS project, or for the Effluent Management Facility, which are all interlinked. These designs cannot be made final in pieces without repeating the consequences of the design-build primary-cause acknowledged failure.

DOE has rejected fast track Design-Build. Why should Ecology allow it to continue with the present permit package? Ecology's phased approach decision from 2002 should be revoked.

## VII. Quality and Safety Problems Persist

In Publication 14-05-004 Ecology responded to public comments on the permit in 2013 by promising to conduct quality determinations: *"Ecology is undertaking several quality determination measures for equipment or systems that have already been constructed, as well as for components that have not yet been installed."*

Ecology's Commitments to the Public to perform Quality Reviews and to rely on completed Safety Reviews is not met.
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- Contrary to Ecology's Commitment to a quality review, the response to comments on installation of the LAW Preheater<sup>27</sup> (See Publication 15-05-004) was to withdraw the 2014 proposed installation due to issues raised by the public. The public comments included unacceptable materials of construction and an inadequate process corrosion data sheet. Ecology withdrew the permit modification request, noting that there were "significant unresolved issues."

What did Ecology do to review quality before allowing the current design package?

Further, Ecology committed in the 2002 Publication 01-05-006 to using DOE's safety evaluation documents to verify safety. Why then does Ecology accept the incomplete hazards analysis for LAW equipment (See 15-TRS-0029), even specific to the ammonia used in the TCO/SCR? Why does Ecology accept continued construction with the outstanding \$800,000 fine for safety failures and corrections not completed in the 2015 Office of Enforcement Consent Order?

Below are comments on specific documents in the proposed change package that demonstrate persistent quality problems. Please note that these comments are a few examples from a cursory review.

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<sup>27</sup> Ecology Publication 15-05-004, *Response to Comments - Modification of the Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Part III, Operating Unit Group 10 (WA7890008967) Waste Treatment and Immobilization Plant September 2 – October 20, 2014*, dated March 2015, Located at <https://fortress.wa.gov/ecy/publications/documents/1505004.pdf>.

## CAUSTIC SCRUBBER COMMENTS

On the Caustic Scrubber Data Sheet 24590-LAW-MKD-LVP-00011, Rev 6 there is a reference to Note 7 (see pages 10 and 11). Note 7 (page 12) states that the vendor will provide a verification/supply the pH operating conditions. Contrary to this note, no vendor operating inputs were provided.

The corrosion evaluation 24590-LAW-NID-LVP-00001, Rev 7 assumes that the nominal pH will be 9.5 (see page 3), without a basis that explains this. However, Section 4 and the conclusion of the corrosion evaluation (sheets 4 and 6) state that “In the region of the scrubber where there is potential for high temperature, presence of acid gases, and the potential use of acid for cleaning, Hastelloy® C-276 or C22® offer resistance to corrosion both at low pH from acid gas and high pH from the sodium hydroxide.”

If the flowsheet (BARD) basis runs at pH of 12, and the operations are at pH of 9.5, the mass balance misrepresents the decontamination factors (DFs) and underestimates the effluent volume.

There is no means to control the caustic scrubber wall temperature. Conduction is ignored. This is not safe-by-design.

Sheet 2 of the corrosion evaluation (operating restrictions) then indicates that the process will be controlled to meet the corrosion limits for type 316 stainless steel, which makes up the sides, but not the bottom of the scrubber. So – Bechtel has modified the chemical process to match the side wall material already selected in a non-conservative way (assuming

a lower temperature). Bechtel did not select materials that match the process. And the process is not understood. There is no engineered feature to control temperature up the side walls of the scrubber. The requirements for nuclear design include a hierarchy that requires a robust design as a priority over administrative or operational controls (DOE-STD-3009). This philosophy has been abandoned for the caustic scrubber in the haste for installation.

The design limits in the corrosion evaluation (sheet 6) are limited to a range of pH of 5 to 10, without recourse to a vendor input. The design limits cite 24590-WTP-RPT-M-11-002, which is not a vendor document, but refers to conditions suitable for type 316 stainless steel. The corrosion evaluation data table (sheet 9 of 24590-LAW-NID-LVP-00001, Rev 7), however shows the pH of the liquid input to the scrubber as **11.43** (noted as not being a maximum), which *exceeds the corrosion analysis range*.

The corrosion evaluation shows (sheet 13) that caustic is added at 5M NaOH. This concentration is more than sufficient to generate a pH 14 solution. Sheet 13 also notes that the pH can be raised to 14 in normal operations if needed to control high halide concentrations.

The Flowsheet Bases, Assumptions, and Requirements Document (BARD), 24590-WTP-

RPT-PT-005, Rev 7 says that the caustic scrubber solution is supposed to be at a concentration of 0.01 Molar NaOH (See page 2.13-9). This is the same<sup>28</sup> as a pH of 12.

At a pH of 12, the caustic scrubber is assumed to remove a fixed fraction of contaminants (per BARD Table 2.13-4 (pages 2.13-21 and 2.13-22)). There is no mention of how much less is removed if the pH is reduced below 12 to the amount required by the corrosion analysis. The results will increase the effluent flow rate, because of the reduction in efficiency. There is no indication in the BARD of the sensitivity of operations to changes in pH:

The engineering specification to the vendor (24590-LAW-3PS-MKAS-T0001, Rev 2, page 13) shows that Bechtel told the vendor that the scrubber must remove 97% of SO<sub>x</sub> gas “with the scrubber reagent “between pH 9 and pH 14.” The vendor was told that the solution would or could be between pH of 9 and 14. This sheet also specifies that the vendor was supposed to provide the optimal range for pH. In addition, Acid conditions in the scrubber identified in the corrosion analysis (pH of 5) were not included in the specification provided to the vendor.

So – the Permit request package is internally inconsistent – stating that the design range is 5 to 10 in the corrosion evaluation, but ordering a system that can operate between pH of 9 and 14 (to be determined by the vendor), and using a flowsheet that assumes a pH of 12. The impact on operations is unknown (safety and quality indeterminate).

In addition, drawing 24590-QL-POA-MKAS-00003-04-00050 Rev 0E does not identify the material of construction for the internal structure and packing support in the scrubber. Nor does this drawing have a corrosion allowance for the packing support. Will it be durable under both the full range of caustic and acid flush conditions?

Also, the IQRPE Structural Integrity Assessment Report, 24590-CM-HC4\_HXYG-00240-02-00013, Rev 0A relies on and references non-final design calculations for Stress Analysis and for Anchor Bolt and Embed design. Both of these are preliminary letter revision calculation. See page 5, for example. This problem has occurred in prior permit change proposals.

- DOE and Bechtel are also aware that:

Condition Report 24590-WTP-GCA-MGT-15-00813, dated 05-21-15 indicated that Bechtel did not understand the Vendor’s “finite element analysis.”

Condition Report 24590-WTP-GCA-MGT-15-00886, dated 06-09-15 indicated that Bechtel knew it did not have a supplier calculation checklist for the off-gas caustic scrubber process, and this was part of a Level A (PL-1) corrective action.

Condition Report 24590-WTP-GCA-MGT-15-00963, dated 06-17-15 indicated that Bechtel lacked documentation of the Caustic Scrubber Vendor’s design analysis software.

Condition Report 24590-WTP-GCA-MGT-15-01214, dated 07-29-15, indicated that Bechtel was aware of an attempt to change the operating conditions to reduce the pH, and

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<sup>28</sup> To convert:  $pOH = -\log_{10}[0.01]$  and  $pH = 14 - pOH$

“believed,” based on the basis of “we are told” that increasing the pH to 14 would be detrimental to operating efficiency. This is without benefit of understanding the vendor software. No basis was provided.

Condition Report 24590-WTP-GCA-MGT-15-02162, dated 12-08-15, indicated a lack of basis for flow rates and vessel sizing, including for caustic scrubber operation.

- DOE and Bechtel are aware of Caustic Scrubber design problems identified in the recent draft LAW Design and Operability Report (factual accuracy is documented in the Record of Review forms), specifically:

Ammonium hydroxide could require removal or flushing (LOP/LVP-18)

There is no way to remove an accumulation of insoluble solids (LOP/LVP-44)

The effects from other unit operations on the startup and shutdown have not been fully analyzed (LOP/LVP-45)

There is no direct means to monitor the condition of the packing or mist eliminators within the caustic scrubber.

The design for removal/replacement for waste handling for the caustic scrubber is incomplete (LRWH-F-06-V-01).

In addition, a recent Commercial Grade Dedication (CGD) Audit Report, 15-QAD-0038, transmitted to Bechtel on August 6, 2015 specifically calls out findings associated with Premier Technologies (the caustic scrubber vendor) and the caustic scrubber itself. For example:

***“Review of Premier Technologies, Inc. Commercial Grade Dedication Procedure***

*The Premier Technologies, Inc. (PTI) CGD procedure, TP-3.4, Commercial Grade Dedication, Rev. 5, dated February 23, 2013, contained several instances in which the requirements of BNI specification 24590-WTP-3PS-GOOO-T0019 were not included in the procedure or, if included, were optional. Examples include:*

- *Technical evaluation*
- *Seismically or environmentally qualified items*
- *Method 1 misconceptions*
- *Method 2 misconceptions*
- *How to deal with other ASME certifications during CGD (PTI Quality Assurance Manual 1.3).*

*BNI did not identify this nonconformance and require correction of the condition by the supplier.*

**21. PTI Technologies [Premier Technology Inc.] - CGD 11-80 - ASME SA240, 316L (UNS S31603) Plate**

- *The PTI CGD Plan, No. 11-80, supporting Purchase Order 99896, for ASME SA240, 316L (UNS N10276) Plate did not provide sufficient evidence that the plate steel.*

*which was being used to fabricate the caustic scrubber vessel, head, and internals that form the pressure vessel boundary could perform its safety function. The CGD plan and documentation of testing contained errors, specifically:*

- *The technical evaluation used the Boiler and Pressure Vessel Code (B&PVC) UNF-65 allowance to not perform brittle fracture testing; however, the technical evaluation did not discuss or contain the additional evaluation for suitability testing that is discussed in the UNF-65 allowance."*

These examples show that the caustic scrubber is not ready for installation. DOE and Bechtel were aware of these problems before sending the permit change request to Ecology.

As a result the taxpayer will be paying to have it "fixed" in place later, or there will be pressure not to fix it at all.

## TCO/SCR COMMENTS

Note that the Thermal Catalytic Oxidizer/Selective Catalytic Reduction (TCO/SCR) has previously also been called the "SCO," complicating searches for PIERS and Condition Reports.

- In 24590-CM-HC4-HXYG-00240-02-00012, Rev 0A, the IQRPE Assessment refers to a Rev "A" calculation as input in 4 places (pages 6, 7, 8, and 9). The calculation is 24590-LAW-MVC-LVP-00004, Rev. A, LVP-SKID-00002, *LAW Thermal Catalytic Oxidizer/Reducer, Stress Analysis with ANSYS*, including ECCN # 24590-LAW - MVE-LVP-00001. Rev "A" design documents are for conceptual design and are not suitable for final design or construction.
- In 24590-CM-HC4-HXYG-00240-02-00012, Rev 0A, the IQRPE Assessment refers to **24590-LAW-M4C-LOP-00001**, Rev. 3, *LAW Melter Offgas System Design Basis Flowsheets* including ECCN # 00003 and 00009 (page 10). However, the remainder of the change package, including the References for Data Sheet 24590-LAW-MKD-LVP-00012, Rev 12, refer to a different document **24590-LAW-M4E-LOP-00009**, with the same title: *LAW Melter Offgas System Design Basis Flow Sheets*. The results for NO<sub>x</sub> concentrations differ in these two calculations, but they have the same title. Neither flow sheet is provided in the permit change package. No dates are given for their publication.
- In 24590-CM-HC4-HXYG-00240-02-00012, Rev 0A, the IQRPE Assessment refers to a Rev "C" calculation for hydrogen generation - 24590-WTP-M4C-V11T-00004, Rev. "C," *Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP*. Again – a letter revision is not suitable for final design or construction.
- The TCO/SCR change package does not mention the DFLAW process or project. This project will change the feed to the LAW facility such that the concentrations of key components will be changed due to the elimination of additions and dilutions from the WTP pretreatment facility. Concentrations of organics and NO and NO<sub>2</sub> in the gas phase will likely change. As a result, the ability of the LAW TCO/SCR to treat the new concentrations and mass flows is unknown. Further, WTP contract Mod 353 to section H, establishes DOE-Directed waste acceptance criteria and design inputs, per letter 15-WTP-0023. Contract Mod 353 states that: "It is acknowledged by the parties that changes to these critical design inputs may materially impact the Contractor's ability to complete CLIN 2.1 and give rise to relief pursuant to the Changes clause of the contract." DOE has therefore acknowledged that the non-design-basis quality inputs in letter 15-WTP-0023 may result in changes to the LAW facility, which includes the off-gas system and the LAW-TCO. And these changes are *expected* to produce rework.

- 24590-WTP-RPT-PT-005, Rev 7, *Flowsheet Bases, Assumptions, and Requirements Document* (BARD) is cited in the change package as a basis for the WTP RCRA Permit. However, this document itself refers to Revision A (Conceptual Design) information in several places. Nor does it address the changes from DFLAW. Further, the BARD contains only "expected" decontamination factors for the TCO (see page 3.3-16), and these are fixed values so changes in temperature, which affect the efficiency of the catalysts, are not accounted for in the flowsheet calculations (see page 3.3-40). Nor are changes in the off-gas composition accounted for. The DFs are assumed to be 50 (reduction of 98% for NO and NO<sub>2</sub> no matter what the inputs are. This is an unverified assumption.

Further, Condition Report 24590-WTP-GCA-MGT-15-01819, dated 10-16-15, identified a lack of quality assurance requirements for scientific data, which includes many of the inputs to 24590-WTP-RPT-PT-005.

- Mechanical Data Sheet 24590-LAW-MKD-LVP-00012, Rev 15 (see page 11) relies on technical reports from off-gas emissions testing using simulants. However, there is no indication that these tests addressed the most challenging conditions per NQA-1 requirements, so the data used could be non-conservative. The relationship to DFLAW feeds is indeterminate.
- Mechanical Data Sheet 24590-LAW-MKD-LVP-00012, Rev 15 shows a change history for the engineering specification that has multiple changes including an unsupported statement that the changes do not affect the design margin (see page 4). Page 4 states that there was a decreased off-gas outlet design temperature, but the effect on the process margin (ability to react at least/more than 98% of the NO<sub>x</sub>) was not evaluated and no margin analysis was required. No margin analysis is available for DFLAW feeds. Reducing the catalyst temperature reduces the capacity and efficiency of the TCO.
- Project PIERS and Condition Reports indicate multiple failures in the TCO design including an out-of-business vendor replaced with a "recovery vendor." These reports include:

24590-WTP-CRPT-QA-08-623-C, dated 11-12-08, DOH Code Compliance, PDSA,  
 24590-WTP-PIER-MGT-09-1520-HLW-TCO, dated 10-08-09, - Quality Level (HLW  
 TCO has the same function as in the LAW facility)  
 24590-WTP-PIER-MGT-11-1265-C, dated 12-13-11, Fatigue Assessment  
 24590-WTP-PIER-MGT-13-0024-C, dated 12-18-12, HLW-TCO PIER - Temperature  
 Margin (HLW TCO has the same function as in the LAW facility)  
 24590-WTP-PIER-MGT-13-0351-C, dated 03-12-13, Clearance of the skid not  
 adequate for Operations and Maintenance  
 24590-WTP-PIER-MGT-13-0511-C, dated 04-30-13, Permit Non-Compliance  
 24590-WTP-PIER-MGT-13-0662-C, dated 06-12-13, RVP Procurement Issues

- 24590-WTP-PIER-MGT-13-1528-B, dated 01-07-14, New Vendor – Issues with reusing the design from a failed vendor
- 24590-WTP-PIER-MGT-14-1452, dated 07-09-15, Commercial Grade Dedication Issues for HLW TCO (same vendor as the LAW TCO)
- 24590-WTP-GCA-MGT-16-00030, dated 01-08-16, TCO Functional Test Plan Not Reviewed by Operations

There is no indication in the Permit package that these PIERS/Condition Reports have been resolved effectively, and the Bechtel Corrective Actions program is suspect, due to multiple prior failures, including multiple improper closures of corrective actions. Bechtel was aware of TCO issues before signing permit change request.

- The draft LAW Design and Operability Report contains recommendations for the LAW-TCO that have not been addressed, including:

*"An analysis of the thermal loading on the TCO skid should be performed to determine whether the materials of construction can accommodate the stresses imposed by the thermal cycling. Although considered unlikely, this analysis may result in redesign of Post CD-4 equipment."*

*"Conduct analysis to determine the maximum flow increase that can be accommodated by the electric heater to remain above the catalyst operating temperature [this affects efficiency and ability to treat organics and NOx]. A new limit on flow rate increase may result."*

*"The viability of the current TCO maintenance approach and associated throughput are indeterminate."*

- The Commercial Grade Dedication Audit, 15-QAD-0038, found problems with the new LAW-TCO Vendor's commercial grade dedication. Example results (there are more) include:

*"Review of the commercial grade survey report and checklist for IONEX (24590-WTP-SSVMATL-13-007, Commercial Grade Survey Report, IONEX Research Corporation, Lafayette, Colorado, Rev. 0) in support of the low-activity waste thermal catalytic oxidizer (TCO)/reducer skid and ammonia skid identified instances in which the documented expectation was not met yet the item was marked as satisfactory. An explanation was not provided as to why the line-of inquiry (LOI) was satisfactory even though the requirements were not met."*

*"The CGD plan for the Low-Activity Waste Catalytic Oxidizer/Reducer Skid and Ammonia Dilution Skid assembly did not document, through the technical evaluation, the critical characteristics representing those characteristics of the item that supported the ability of the host equipment to perform the required safety functions during and after a design basis accident. Additionally, the individual CGD plans for*

*the components of the skid did not address the need for system performance to meet the safety function during and after a seismic event.”*

- A DOE-HQ review of the LAW Hazards Analysis (15-TRS-0017, August 26, 2015) found aspects of the Hazards Analysis inadequate, including inappropriate, or misclassified candidate hazard controls for the ammonia system. (Ammonia is a reagent used in the LAW-TCO.)
- A draft DOE-OIG assessment of the WTP Corrective Action Program concluded (06-03-15) “it is too early to draw conclusions on the efficacy of the corrective actions taken and underway.” Therefore, changes to the designs as a result of the findings may not be effective themselves. The IG found that DOE “did not ensure that previous Bechtel initiatives to address corrective action program implementation problems were fully implemented or sustained.”

#### **LAW HEPA PREHEATER COMMENTS**

- The LAW HEPA Preheater IQRPE report continues to rely on a letter revision pipe stress calculation that is not a final design. 24590-CM-HC4-HXYG-00240-02-00010, Rev 0A refers to 24590-LAW-P6C-LOP-10016, Rev. E, *Pipe Stress Analysis for LOP System (Design Calculation)*. Letter revisions are not final design documents.
- The LAW HEPA Preheaters are upstream of the TCO/SCR, so they are exposed to untreated and lethal concentrations of NO<sub>x</sub> (many times the concentration that is immediately dangerous to life and health). See the BARD, 24590-WTP-RPT-PT-02-005, Rev. 7, Figure 1.2-3, Page 1.2-7.

Drawing 24590-CD-POA-MEE0-00003-03-00004, “Immersion Heater Flanged” identifies the heated medium as air with “no lethal substances” instead of a process toxic off-gas. See sheet 1, Sheet 3 of this drawing shows the number of commercial grade material specifications. The absence of a commercial grade dedication report in the permit package is contrary to the requirement that a final permit contain a *description of procedures, structures, or equipment used at the facility to prevent undue exposure of personnel to dangerous waste, and prevent releases to the atmosphere*. Without a commercial grade dedication report, the features needed in the heater to prevent releases to the workers cannot be verified as effective.

## VIII. The Certification Statements are Open to Question

The managers of Bechtel National Inc. and DOE-Office of River Protection are required by WAC-173-303-810 to sign a certification that states:

*"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel gather the and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

What standard does Ecology use for evaluating the value and truthfulness of these signatures?

## IX. In Conclusion

The LAW TCO/SCR, Caustic Scrubber and HEPA Preheaters should not be installed.

The Pretreatment DW Permit should be revoked.

Further construction should stop.

No further WTP Permit revisions should be made until there is a final DFLAW, LAWPS and EMF integrated design. Ecology's decision to use a phased approach for permitting should be revoked.

An independent multidisciplinary quality assurance and process audit should be conducted on any future WTP permit proposal prior to public review.

Already installed equipment should be revisited to verify the status of open quality and safety problems. A 100% integrated extent of condition is warranted.

If this can't be done, Ecology should consider closing the tank farms as a landfill, with void space fill and water intrusion covers. After all, DOE has proven that the "urgent" risk from the waste isn't really urgent, since their design basis for LAWPS is to put the cesium-137 right back in the tanks. The "urgent" HLW risk isn't urgent since DOE has proposed delaying HLW treatment from 2007 to 2039 (32 years).

Looking to the future, care should be taken in reviewing the DFLAW design. In Section B of the WTP contract, DOE offers a \$9 million incentive fee including \$100,000 a month for every month that the design is completed ahead of April 30, 2018. This is an incentive to cut corners, and to resist making genuine corrections.

Prior experience is that DOE has readily paid fee for hastily completed work that was incomplete. Schedule was met, fees were paid, and the products were sent back for rework. Examples include fee paid for defective vessels; fee paid for resolving the "M3" mixing issue; and \$4.5 million fee paid for reducing sodium addition in Pretreatment - apparently a reward because PT is failed so can't add any sodium. Fee was paid in spite of the statement by DOE that the sodium reduction milestone was "of no value to the government." (See Item 9 of CCN-269659.)

It is time to stop repeating the same actions, incentives, and permit changes that perpetuate the failures and promote needless risk at facility startup.

Information Assessed	Source of Information	Assessment
<p><b>Design (cont'd)</b></p> <p>If a non-standard Plant Item is to be used, the design calculations demonstrate sound engineering principles of construction.</p>	<p>Material Requisition, Mechanical Data Sheet, Specifications, and Drawings listed above under References;</p> <p>ASME Boiler and Pressure Vessel Code (B&amp;PV), Section VIII, Division 1 &amp; 2, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers;                      ASME B31.3 Code, Process Piping, American Society of Mechanical Engineers;                      AISC N690, American National Standard-Nuclear Facilities-Steel Safety Related Structures for Design, Fabrication, and Erection, American Society of Steel Construction;                      AISC M016, Manual of Steel Construction, ASD 9<sup>th</sup> Edition, American Society of Steel Construction;                      AWS 1.1, Structural Welding Code-Steel, American Welding Society;                      AWS 1.6, Structural Welding Code-Stainless Steel; American Welding Society;                      UBC 1997, Uniform Building Code.                      24590-WTP-DC-ST-01-001, Rev. 13, Structural Design Criteria;                      ASTM Standards, American Society for Testing and Materials.                      24590-LAW-MVC-LVP-00004, Rev. A, LVP-SKID-00002, LAW Thermal Catalytic Oxidizer / Reducer, Stress Analysis with ANSYS, including ECCN # 24590-LAW-MVE-LVP-00001.</p>	<p>The LAW LVP TCO Unit is a non-standard offgas treatment assembly that is shop fabricated. The referenced Material Requisition, Mechanical Data Sheet, and Specifications require that the TCO Unit be designed, fabricated, inspected, tested, and installed per the applicable codes, standards, and design criteria listed in the Source of Information column herein. Review of the TCO Stress Analysis and drawings show that appropriate applicable load cases and combinations thereof were used utilizing sound engineering principles for the design and construction of the TCO Unit. Furthermore, approval and acceptance of the vendor fabrication drawings by Bechtel National Inc. (BNI), is an added assurance that all applicable requirements stated in aforementioned documents (including daughter documents) for the TCO Unit have been met.</p> <p><i>Not Final Design. On 6/4 places</i></p>

Information Assessed	Source of Information	Assessment
<p><b>Waste Characteristics</b></p> <p>Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, storage temperature)</p>	<p style="text-align: center;"><i>LETTER REV IS NOT FINAL DESIGN.</i></p> <p>System Description, Mechanical Data Sheet, and Corrosion Evaluation listed above under References;</p> <p>24590-WTP-PER-PR-03-002, Rev. 3, Control of Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Unit Systems; 24590-WTP-M4C-VIIT-00004, Rev. C, Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP. 24590-LAW-M4C-LOP-00001, Rev. 3, LAW Melter Offgas System Design Basis Flowsheets, including ECCN # 00003 and 00009; CCN 280210, LAW Miscellaneous Treatment Unit Hydrogen Accumulation Documentation for the DWP Administrative Record.</p> <p style="text-align: center;"><i>SAME title as 24590-LAW-M4C-LOP-00001</i></p>	<p>The Mechanical Data Sheet presents the operating temperatures and pressures for the TCO Unit. The Corrosion Evaluation documents address the chemical composition of the offgas in order to select appropriate TCO Unit materials and specify the corrosion allowance. The System Description document identifies the offgas being handled by the TCO Unit as hazardous, but not as ignitable or flammable. The main function of the TCO Unit is to prevent the escape of toxic and hazardous gas vapors to the environment from the LAW offgas system. The TCO Unit design is required to provide an intact housing pressure boundary during normal and abnormal operations and during and after design level seismic events. Waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are appropriately addressed in the Control of Toxic Vapors and Emissions, Calculation of Hydrogen Generation Rates, Melter Offgas System Design Basis Flowsheets, and CCN 280210 documents. The System Description and the Control of Toxic Vapors and Emissions documents describe that the LAW TCO Unit remove volatile organic compounds (VOCs) and nitrogen oxides (NO<sub>x</sub>) compounds from the LAW offgas LVP exhaust system. Review of the Calculation for Hydrogen Generation Rates, Melter Offgas System Design Basis Flowsheets, and CCN 280210 documents show that this miscellaneous TCO Unit does not pose any hydrogen generation or accumulation hazard.</p>
<p>Plant Item is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.</p>	<p>Corrosion Evaluation, Mechanical Data Sheet, and System Description listed above under References.</p>	<p>The Corrosion Evaluation documents and the Mechanical Data Sheet adequately demonstrate incorporation of identified waste characteristics into the TCO Unit design. Normal and abnormal operating conditions are discussed in the System Description document. The offgas passing thru the SCR catalyst unit is injected with ammonia vapors and C3 air from the ammonia/air dilution skid (LVP-SKID-00003) housing the dilution fans (LVP-FAN-00001/00002) and a mixing chamber.</p>

Data	Document #	Rev	Document Title
Quality Level	24590-LAW-M6-LVP-00005001	3	<i>P&amp;ID – LAW Secondary Offgas/Vessel Vent Process System Ammonia Dilution Skid</i>
	24590-LAW-M6-LVP-00005002	3	<i>P&amp;ID-LAW-Secondary Offgas/Vessel Vent Process System SCO/SCR Skid</i>
Seismic Category	24590-LAW-M6-LVP-00005001	3	<i>P&amp;ID – LAW Secondary Offgas/Vessel Vent Process System Ammonia Dilution Skid</i>
	24590-LAW-M6-LVP-00005002	3	<i>P&amp;ID-LAW-Secondary Offgas/Vessel Vent Process System SCO/SCR Skid</i>
2 Melter Maximum Flow Rate	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
Design Volumetric Flow Rate	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 9</i>
2 Melter Nominal Inlet Temperature	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
2 Melter Maximum Inlet Temperature	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
Design Inlet Temperature	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 15</i>
Maximum Outlet Temperature	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 3</i>
Design Outlet Temperature	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
2 Melter Nominal Pressure	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
2 Melter Maximum Pressure	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
Design Inlet Pressure (Vacuum)	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 8</i>
Allowable Differential Pressure (Nominal)	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 11</i>
Allowable Differential Pressure (Maximum)	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 15</i>
Allowable Differential Pressure (Design)	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 9</i>
2 Melter Maximum Mass Flow	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 15</i>
2 Melter Maximum Density	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 15</i>
2 Melter Nominal Mass Flow	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 11</i>
2 Melter Nominal Density	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 11</i>
2 Melter Nominal Volumetric Flow	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 11</i>
2 Melter Nominal Offgas Composition	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Pages 12-14</i>

#### 3.3.3.8.1 Design Data - Catalytic Oxidizer Electric Heater

- Provide enough power to raise the offgas temperature to 750 °F
- Pressure differential: 2.5 mbar
- Line pressure drop from the heater to the VOC catalyst: 0.2 mbar

#### 3.3.3.8.2 Operating Logic - Catalytic Oxidizer Electric Heater

The heater is operated as necessary to maintain temperature. The heater load is greatest during startup and when the NO<sub>x</sub> feed concentration is low. Exothermic reactions may provide enough heat to reduce or eliminate the need for heating.

#### 3.3.3.8.3 Energy Contributions - Catalytic Oxidizer Electric Heater

Electrical power: enough power is provided to the heater to raise the temperature to the catalyst beds' operating temperature of 750 °F. The amount of power supplied depends on the cold side outlet temperature of the heat exchanger immediately upstream of the heater.

#### 3.3.3.8.4 Services - Catalytic Oxidizer Electric Heater

Electrical power: enough power is provided to the heater to raise the catalyst beds' operating temperature to 750 °F.

#### 3.3.3.8.5 Chemistry - Catalytic Oxidizer Electric Heater

None.

### 3.3.3.9 Thermal Catalytic Oxidizers

Oxidation of VOC and CO is the next step in the catalytic unit after heating. The thermal catalytic oxidizer (TCO) column (LVP-SCO-00001) is placed at the beginning of the unit. The oxidation is exothermic. Through this catalyst the organics are generally oxidized to carbon dioxide, hydrogen chloride (if chlorinated compounds are present), and water vapor. Trace amounts of fluoride, bromide, and iodide may also be present in the oxidizer exhaust, depending on the organic compound oxidized.

Pertinent design and operating parameters for this unit include the following.

#### 3.3.3.9.1 Design Data - Thermal Catalytic Oxidizers

(24590-LAW-MAC-LVP-00007, 24590-LAW-MKD-LVP-00012)

- Organic removal efficiency: 95 % (DF = 20)
- The expected DFs for each component are in Table 3.3-4
- Required operating inlet temperature: 650 °F (343 °C) minimum
- Pressure drop across the bed: 5 mbar
- Line pressure drop from the bed to the SCR: 3 mbar

Table 3.3-4 LAW Secondary Offgas System Decontamination Factors

Components	DF HEPA (First) Nominal	Source	DF HEPA (Second) Nominal	Source	DF Thermal Oxidizer	Source	DF NOx SCR	Source	DF Caustic Scrubber	Source	DF Mercury Adsorp. Column	Source
PO43-	3333	18	500	18	1	20	1	22	1	9	1	9
SiO4-4	3333	18	500	18	1	20	1	22	1	24	1	24
SO42-	Table 3.3-3	--	Table 3.3-3	--	1	20	1	22	1	9	1	9
acetate	3333	19	500	19	20	20	1	22	1	24	1	24
oxalate	3333	19	500	19	20	20	1	22	1	24	1	24
citrate	3333	19	500	19	20	20	1	22	1	24	1	24
EDTA	3333	19	500	19	20	20	1	22	1	24	1	24
formate	3333	19	500	19	20	20	1	22	1	24	1	24
glycolate	3333	19	500	19	20	20	1	22	1	24	1	24
HEDTA	3333	19	500	19	20	20	1	22	1	24	1	24
IDA	3333	19	500	19	20	20	1	22	1	24	1	24
Sucrose	3333	18	500	18	20	20	1	22	1	9	1	9
PPG	3333	30	500	30	20	20	1	22	1	24	1	24
PDMS	3333	30	500	30	20	20	1	22	1	24	1	24
C12H4C16(l)	3333	1	500	1	20	1	1	1	1	1	1	1
C2H3N(l)	3333	1	500	1	20	1	1	1	1	1	1	1
C12H4C16(g)	3333	1	500	1	20	1	1	1	1	1	1	1
C2H3N(g)	3333	1	500	1	20	1	1	1	1	1	1	1
H2O	1	18	1	18	1	20	1 & produced	22	calculated	9	1	9
CO	1	18	1	18	20	20	1	22	1	9	1	9
CO2	1	18	1	18	1	20	1	22	1.02	10	1	9
HCl	Table 3.3-3	--	Table 3.3-3	--	1	20	1	22	100	9	33.3	26
HF	Table 3.3-3	--	Table 3.3-3	--	1	20	1	22	100	9	33.3	26
HI	Table 3.3-3	--	Table 3.3-3	--	NA		NA		NA		NA	
I2	Table 3.3-3	--	Table 3.3-3	--	1	20	1	22	100	9	100	26
N2	1	18	1	18	1	20	1 & produced	22	1	9	1	9
NH3	1	18	1	18	1	20	consumed	22	1.4	28	1	9
NO	1	18	1	18	1	20	50	21	1	9	1	9
NO2	1	18	1	18	1	20	50	21	1.04	10	1	9
O2	1	18	1	18	1	20	1	22	1	9	1	9
P2O5(s)	3333	18	500	18	1	20	1	22	1	9	1	9
SO2	Table 3.3-3	--	Table 3.3-3	--	1.25	20	1	22	33.3	25	1	9

NOx



River Protection Project  
Waste Treatment Plant

**MECHANICAL DATA SHEET**  
**LAW Catalytic Oxidizer / Reducer**

PLANT ITEM No.

24590-LAW-MX-LVP-SKID-00002

24590-LAW-MX-LVP-SKID-00003

*(General Note 2)*

Data Sheet No.

24590-LAW-MKD-LVP-00012

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**General Notes**

1. Seller to confirm values and specify specific model numbers for components listed.
2. LVP-SKID-00002 is the catalytic oxidizer/ reducer unit, and is made up of sub component tag numbers:
  - 24590-LAW-LVP-HX-00001
  - 24590-LAW-LVP-HTR-00002
  - 24590-LAW-LVP-SCO-00001
  - 24590-LAW-LVP-SCR-00001
- LVP-SKID-00003 is the ammonia supply and air dilution equipment and piping, and includes sub component tag numbers:
  - 24590-LAW-LVP-FAN-00001 & 00002
  - Deleted
  - Deleted
  - 24590-LAW-LVP-HEPA-00004A/B
  - Deleted
3. Data marked with an asterisk \* is, or will be, provided by Seller.
4. Equipment on LVP-SKID-00002 is Dangerous Waste Permit Affecting.
5. Deleted
6. Ammonia supply design pressure shall be applied to the design of the dilution air piping, up to and including valve YV-0538, and to the combined ammonia/air piping up to nozzle N04.
7. Equipment location is shown on Drawings 24590-LAW-P1-P23T-00051 and 24590-LAW-P1-P23T-00052.
8. Oxidation catalyst residence time is based on pilot plant performance at the Catholic University's Vitreous State Laboratory (VSL). Reference: Regulatory Off-Gas Emissions Testing on the DMI200 Melter System Using HLW and LAW Simulants, 24590-101-TSA-W000-0009-166-00001.
9. Organic loading is based on pilot plant performance at the Catholic University's Vitreous State Laboratory (VSL). Reference Regulatory Off-Gas Emissions Testing on the DMI200 Melter System Using HLW and LAW Simulants, 24590-101-TSA-W000-0009-166-00001 and Small Scale Melter Testing for Allyl Alcohol Method Verification, 24590-101-TSA-W000-0009-195-00002.
10. Deleted
11. Reference Corrosion Evaluations, 24590-LAW-N1D-LVP-00005, -00006, -00007 and -00008. No corrosion allowance for heating elements. Heaters are designed for replacement. Expected life of the heaters is nominally 5 years.



River Protection Project  
Waste Treatment Plant

**MECHANICAL DATA SHEET**  
**LAW Catalytic Oxidizer / Reducer**

PLANT ITEM No.

24590-LAW-MX-LVP-SKID-00002

24590-LAW-MX-LVP-SKID-00003

(General Note 2)

Data Sheet No.

24590-LAW-MKD-LVP-00012

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11	<p>Revised the skid height, removed the conceptual design information, deleted component tag numbers, revised the quality level in General Note 5, updated the EQ data sheet to the latest version, added reference list, removed the nozzle loads from the technical notes and added them to the data sheet, added 20% to the nozzle loads per email from Grant Goolsby dated 6/19/14 – CCN: 270007. Major revision, triangles not used for clarity. Margin is not affected. This datasheet summarizes technical data developed in calculations and reports or documented in design basis documents. These documents contain the margin.</p>	Mike O'Neil	D Ricketson	G Goolsby	N/A	Dick Hills	Stuart Kretzschmar	10/21/14
10	<p><b>No margin analysis justification is required</b> because these changes do not reduce or eliminate margin (ref. CCN 222685). Revision triangles used. Added technical justification to process note 10. Increased overall length and width due to analyzer probe nozzle addition. Clarified reference points for TCO inlet/outlet height measurement. Revised North arrow for ammonia skid layout. Deleted FILT-00001 from general note 2. Revised section 4.4.3.1. Revised EQD, Section 20. Mounting Method. No margin justification is required because these changes do not reduce or eliminate margin. (Ref. CCN 222685). <b>Revised the Offgas Outlet Minimum Temperature.</b></p>	M. O'Neil No Comments per email dated 2/24/13	J. Marsh	S. Edwards	D. Krahn Comments resolved per email dated 6/14/13	D. Hills No Comments per email dated 2/12/13	Peter Omel	6/19/13
9	<p>Revision triangles used. Complete rewrite of the EQD into the new form. Allowable differential pressure has decreased. However, the SELLER indicates the allowable differential pressures are unattainable. Specified inlet/outlet nozzle height. Increased the allowable envelope and shipping height of the Ammonia/Air Dilution Skid per Seller request. Increased the allowable length of the TCO Skid. <b>Decreased Offgas Outlet Design Temperature.</b> Incorporated TCO nozzle design loads to reflect TCN 24590-QL-MRA-MBT0-00007-T0006. Decreased Abnormal High Temp and DBE High Temp per 24590-LAW-M0E-M40T-00007.</p>	M. O'Neil	D. Nelson	J. Wood	D. Krahn	R. Mills	D. Mildon	07-24-12

Information Assessed	Source of Information	Assessment
<p>Design (cont'd)</p> <p>Plant Item has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.</p>	<p>Specifications, Mechanical Data Sheet, and Material Requisition listed above under References;</p> <p>ASME Boiler and Pressure Vessel (B&amp;PV) Code, Section VIII, Div. 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers;</p> <p>ASME Boiler and Pressure Vessel (B&amp;PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers;</p> <p>ASME B 16.5, Pipe Flanges and Pipe Fittings Standard, American Society of Mechanical Engineers;</p> <p>ASME B31.3, Process Piping, ASME Code for Process Piping, American Society of Mechanical Engineers;</p> <p>NFPA 70, National Electrical Code, NFPA-70-1999).</p> <p>UBC 1997, Uniform Building Code, International Conference of Building Officials;</p> <p>24590-LAW-N1D-LVP-00009, Rev. 1, Corrosion Evaluation for LAW Melter Offgas HEPA Pre-heaters (LVP-HTR-00001A/B and -00003A/B);</p> <p>24590-LAW-P6C-LOP-10016, Rev. E, Pipe Stress Analysis for LOP System (Design Calculation);</p> <p>24590-LAW-PHC-LVP-40001, Rev. 0, RPP-WTP Engineered Support Calculation for LAW-LVP-H30174, LAW-LVP-H30175, LAW-LVP-H30176, &amp; LAW-LVP-H30177, including ECCN # 00016 (Design Calculation);</p> <p>24590-CD-POA-MEE0-00003-05-00002, Rev. 00E, Seismic Analysis of Flanged Electric Heater (LVP-HTR-00001A/B &amp; -00003A/3B Housing Units Design Calculation).</p>	<p>The Technical Requirement listed in the MR and in MDS for HEPA Pre-heater Housings require that these MUs including all related components and appurtenances be designed and fabricated in accordance with the applicable sections of ASME and NFPA 70 codes and standards listed in the Source of Information column. These codes and standards require specific consideration of operating pressures, temperatures, corrosion allowance, and seismic loads in the design process. The Mechanical Data Sheet identifies the operating pressure and temperature ranges and seismic categories for the subject MUs. A corrosion allowance of 0.0425" is recommended for these MUs as identified in the Corrosion Evaluation document. The UBC 1997 Code specifies the seismic loads for the SC-III equipment. <b>The listed Design Calculation reviewed shows that the applicable loading parameters including the applicable design change notices such as DCNs, TCNs, and SDDR were appropriately considered in the design process and the MU housings will have adequate strength to sustain them during their design life.</b></p>

**Table B-2-F-1. DFLAW Design Completion Fee**

DFLAW Design Completion Fee Milestones	Fee (\$)
<b>DFLAW Design Completion</b>	
<b>Interim Milestone Completion Incentive Fee –</b>	
<u>Description:</u>	
1) Complete the constructability review, model review and initial Hazard Analysis for the DFLAW Effluent Management Facility by-	
December 31, 2015	\$500,000
After March 31, 2016 and before June 30, 2016	\$250,000
After June 30, 2016	\$0
2) Prepare and issue the DFLAW EMF Safety Basis Change Package (SBCP)/Preliminary Documented Safety Analysis (PDSA) update as an addendum to the LAW PDSA by-	
July 31, 2016	\$500,000
After October 30, 2016 and before January 31, 2017	\$250,000
After January 31, 2017	\$0
<b>Cost Incentive Fee –</b>	
<u>Description:</u> DOE and the Contractor will share cost under runs on completion of CLIN 2.1 of less than target contract cost (\$75M) in the ratio of 80% DOE/20% Contractor, subject to the maximum combined fee limitation.	
DOE and the Contractor will share cost overruns on completion of CLIN 2.1 of more than target contract cost (\$75M) in the ratio of 80% DOE/20% Contractor, subject to the minimum fee limitation.	
<b>Schedule Incentive Fee –</b>	
<u>Description:</u> For every full month DFLAW Design Completion is accepted as complete per Section J Attachment Q, prior to April 30, 2018, fee will be increased by \$100,000 subject to the maximum combined fee limitation.	
In the event DFLAW Design Completion is accepted as complete between April 30, 2018 and July 31, 2018, fee will be reduced by \$100,000 for each full month completion occurs after April 30, 2018 per Section J Attachment Q.	
In the event DFLAW Design Completion is accepted as complete per Section J Attachment Q after July 31, 2018, total fee available will be reduced to the minimum fee of \$750,000.	
<b>Minimum Fee under DFLAW Design Completion (exclusive of any Interim Milestone Completion Fee)</b>	\$750,000
<b>Target Fee under DFLAW Design Completion (exclusive of any Interim Milestone Completion Fee)</b>	\$4,500,000
<b>Maximum Fee inclusive of Cost, Schedule &amp; Interim Milestone Completion Incentive Fee</b>	\$9,000,000

## C.7 FACILITY SPECIFICATION

The Facility Specification provides minimum functional requirements for the process and facility design and the waste treatment capacity requirements. Additional requirements are contained in Section C.6, *Standards*. DOE will consider changes to the Facility Specifications that improve life-cycle performance, cost, and schedule.

- (a) **Functional Design Requirements:** The WTP is comprised of five major facilities, Pretreatment (PT), LAW immobilization, HLW immobilization, Analytical Laboratory, and Balance of Plant Facilities (BOF). The WTP shall be designed to:
- (1) Have a forty (40)-year operating life for the operating facilities (PT, HLW, LAW), Analytical Laboratory, and BOF exclusive of ancillary facilities (i.e., warehouses, construction support facilities, and administrative offices).
  - (2) Separately receive and store LAW feed (defined in Specification 7, *Low-Activity Waste Envelopes Definition*) and HLW feed (defined in Specification 8, *High-Level Wastes Envelope Definition*) in appropriately designed vessels. The DOE will provide waste transfer lines to an interface point described in ICD 19. The DOE will also provide adequate pumping motive force to transfer the waste to the WTP Receipt Vessels.
  - (3) **For CLIN 2.1, LAW Vitrification shall be designed to receive treated LAW feed (Specification 7, Envelope E) from a Low Activity Waste Pretreatment System (LAWPS) provided by DOE.** The DOE will provide waste transfer lines to an interface point described in ICD 30. The DOE will also provide adequate pumping motive force to transfer the waste to the WTP Receipt Vessels. (350)
  - (4) Treat and immobilize the LAW feed (Specification 7, Envelope A, B, C and E) (350) and provide the final waste products described in Specification 2, *Immobilized Low-Activity Waste Product*, for return to DOE.
  - (5) Implement the sludge treatment process steps as proposed by the Contractor, and approved by DOE in accordance with Standard 2, (a), (3), (iii), for solids washing, caustic leaching, and oxidative leaching; immobilize the HLW feed and radionuclides separated from LAW feed, and provide the final waste products described in Specification 1, *Immobilized High Level Waste Product*, for return to DOE.
  - (6) Disposition all secondary wastes in accordance with ICD requirements; secondary wastes are identified in Section C.9, *Interface Control Documents* and Standard 6, *Product Qualification, Characterization and Certification*.
  - (7) The Pretreatment Facility shall have the capability to return to the Hanford Double-Shell Tank Farm process streams in accordance with Specification 9, *Liquids or Slurries*, transferred to DOE tanks by pipeline.
  - (8) Provide for safeguards and security of DOE owned materials, property, and information in accordance with Standard 8, *Safeguards and Security*.
  - (9) Include a Radiochemical Analytical Laboratory to support the operations of the facilities, including: process control, waste form qualification testing, environmental analyses, and limited technology testing. The capacity of the Analytical Laboratory shall be sufficiently sized and scoped to support the waste treatment capacity of the facilities. The technical basis to support the definition of the Analytical

Table C.5-1.1, Deliverables

Item No.	Deliverable	Reference	Action Required	DOE Action Party	Point of Delivery	Contract Due Date
C.7-1	Procedure to Determine the Waste Feed Treatment Approach	C.7(d) (1)(vii) Spec. 12	A	D	COR (M131)	one year before the start of cold commissioning for the Pretreatment Facility (255)
C.8-1 (350)	Compositional and radionuclide limits for Envelope E	C.8 Spec 7 (7.2.2.1)	C	D	COR	TBD
C.9.1	Interface Control Documents	Section C.9	J	D	COR (M131)	7/15/2001, 3/15/2002, and as required
H.1	Environmental Permits	Clause H.26 (d)(M152)	A	D	COR (M131)	ongoing
H.2	Litigation Management Plan	Clause H.33	A	D	COR (M131)	4/15/2001
H.3	Deleted					
H.4	Property Management System (M120)	Clause H.51	A	D	COR (M131)	10/1/2008, with annual updates thereafter

Legend Definitions:

- A Approval — The deliverable shall be provided to DOE for review and approval. DOE will review the deliverable and provide comments in writing. Comments will be discussed through the partnering process and the Contractor is required to provide written responses using Review Comment Records. Documents shall be re-written to incorporate all DOE mandatory comments. Once a deliverable or document has been approved by DOE, it shall be placed under change control and no changes to that document shall be made without DOE approval. All documents and deliverables that previously had a "K" designation and that were concurred upon by DOE shall be deemed "approved" by DOE.
- C Review and Comment — The deliverable shall be provided to DOE for review and comment. DOE will have the option for reviewing the information and providing comment. The Contractor shall respond to all written comments in Review Comment Records form. DOE comments that cannot be resolved in the appropriate partnering team shall be elevated to the Project Management Team for resolution.
- D U.S. Department of Energy, Office of River Protection.
- COR Contracting Officer's Representative (M131)



The HTWOS model is used to develop a technical baseline by first developing an integrated set of technical and programmatic assumptions for input to the model or for configuring the model. Then the HTWOS model is run to determine a possible sequence of events during the mission. Outputs from the model include projected schedule dates for SST waste retrievals, double-shell tank (DST)-to-DST waste transfers, Waste Treatment and Immobilization Plant (WTP) feed delivery transfers, WTP glass production, supplemental treatment feed delivery transfers, and supplemental treatment production. In addition, the HTWOS model can track the quantities and compositions of waste moved through various points in the system and provide estimates of the quantities and compositions of immobilized products.

The technical assumptions used as input include, but are not limited to, tank waste inventories, system capacities and processing rates, minimum and maximum volumes, system performance, physical constraints inherent to the equipment, and safety limitations. Programmatic assumptions include, but are not limited to, constraints from current plans or business strategies, schedule dates for facility availability, including hot commissioning, and for equipment outages. HTWOS assists in defining the required operational configuration (capacities, transfer routes availability, etc.) to match programmatic constraints by showing when assumptions conflict with each other and constrain the mission. The HTWOS modeling tool can be used to evaluate integration across multiple process steps, programs, and companies. Because the mass balance is dynamic, the model can be used to predict when mass movements in the system will occur, and form the basis for project schedules and program planning. Project schedules, program planning, and treatment/contractor integration can all be linked to a technical baseline contained in the model. The model can also be used to evaluate the impact of inventory uncertainties or of a change in strategy of a contractor during the mission.

## 1.2 SCOPE

The HTWOS model is a custom-developed **grade D non-safety, quality-affecting** software application. The approved Software Grading Checklist can be found in the Hanford Information System Inventory (HISI) under entry number (#) 638. The HTWOS model was developed on the Gensym<sup>®</sup> G2<sup>®</sup> software platform. The Gensym<sup>®</sup> G2<sup>®</sup> software is registered in the HISI on the Software tab within the HTWOS HISI entry. A check of the Software Engineering Change Board (SECB) Approved Software List on 8/13/2013 showed the G2<sup>®</sup> software as "In Use by Field" on June 1, 2012, so the G2<sup>®</sup> software can be considered as being approved by the SECB on June 1, 2012.

Use of the HTWOS model is supported by the Hanford Tank Waste Operations Simulator to Excel<sup>®</sup> (HTWOS2XL) software application, by Excel<sup>®</sup> spreadsheet templates, and by the Hanford Tank Waste Operations Simulator Database (HTWOSDB). The HTWOS2XL application is a custom-developed grade D non-safety, quality-affecting software application registered under HISI # 2215. The Excel<sup>®</sup> spreadsheet templates are grade D non-safety, quality-affecting spreadsheets registered under HISI # 2807. The HTWOSDB is a grade D non-safety, quality-affecting software application registered under HISI # 2854.

## 1.3 ASSUMPTIONS AND CONSTRAINTS

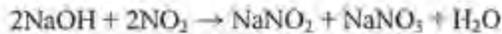
The following bullets identify the project-management-based assumptions and constraints for the HTWOS model.

Custom Developed Software Class A,B, C or D Documentation Checklist				
Software Name:	Hanford Tank Waste Operations Simulator			
HISI Number:	638	HISI Acronym:	HTWOS	Software Grade: D
Software Owner Name:	R. A. Kirkbride			
STSA Name:	M. J. Rodgers			
<input checked="" type="checkbox"/>	Acceptance criteria are defined (4.2.4.1)	2.7.8		
	<b>Software Safety Plan (4.2.5)</b>			
<input checked="" type="checkbox"/>	Software Safety Plan completed. (Not needed for grade D) (4.2.5)	2.8		N/A for grade D software.
<input checked="" type="checkbox"/>	Failure Mode analysis is addressed. (4.2.5)	2.8		N/A for grade D software.
	<b>Acceptance Test Plan (4.2.4.3)</b>			
<input checked="" type="checkbox"/>	Do computer program test procedures provide for demonstrating the adherence of the computer program to documented requirements? (R11 200(a))	2.9		N/A for the SMP; the MMR process demonstrates the adherence of the computer program to documented requirements for specific model changes.
<input checked="" type="checkbox"/>	For those computer programs used in design activities, do computer program test procedures provide for assuring that the computer program produces correct results? (R11 200(a))	2.9		N/A, the HTWOS model is not used in design activities.
<input checked="" type="checkbox"/>	Do the procedures also provide for evaluating technical adequacy through comparison of test results from alternative methods such as hand calculations, calculations using comparable proven programs, or empirical data and information from technical literature? (R11 200(a))	2.9		
<input checked="" type="checkbox"/>	Are test requirements and acceptance criteria based upon specified requirements contained in applicable design documents, or other pertinent technical documents that provide approved requirements? (R11 200(b))	2.9		N/A

#### 2.13.3.4 Caustic Scrubber

The caustic scrubber removes acidic gases (primarily NO<sub>x</sub>) and large particulates. Demineralized water and 5 M NaOH are added to the scrubber sump to maintain a 0.01 M NaOH scrubbing solution. Nitrogen oxide, present as NO<sub>2</sub> and carbon dioxide in the vessel vent offgas stream will react with the NaOH solution according to the following chemical equations:

##### Equation 2.13-14



and

##### Equation 2.13-15



The baseline DFs applied to the caustic scrubber are shown in Table 2.13-3 and are based on the mechanical data sheet for the PVP scrubber (24590-PTF-MKD-PVP-00002).

The conditions for the vessel vent offgases at the inlet and outlet of the caustic scrubber are 138 °F (58.9 °C) and 77 °F (25 °C) respectively at 100 % relative humidity (24590-PTF-MEC-PVP-00005, Rev B).

The concentration of NO<sub>2</sub> in the vessel vent offgas stream is negligible (24590-PTF-MVC-PVP-00012). Therefore, the chilled water load for the vessel vent scrubbing liquid cooler due to heat of reaction is also negligible.

A batch volume of approximately 2160 gal caustic scrubbing solution will be transferred to the plant wash vessel, PWD-VSL-00044, as often as necessary at 60 gpm (24590-PTF-MVC-PVP-00012).

#### 2.13.3.5 High-Efficiency Mist Eliminators

Three HEMEs (PVP-HEME-00001A/B/C) remove sub-micron aerosols and particulates from the vessel vent offgas stream. Two HEMEs operate in parallel while the third is in standby. Because HEMEs are required to operate wet during normal ops, a continuous atomizing spray of demineralized water is provided at the inlet nozzle to each HEME. As a result, the offgas stream exiting the HEME will be saturated. The demineralized water will gravity drain to the HEME drain collection vessel, PVP-VSL-00001.

The baseline DFs applied to the HEMEs for particulates, acid gases, and vapors are 200, 1, and 1, respectively (24590-WTP-RPT-PO-03-008).

The summed flow rates of demineralized water entering the two operating HEMEs is 8 gal/hr (24590-PTF-MVC-PVP-00010). An 800 gal batch volume of HEME drain solution will be transferred to the plant wash vessel, PWD-VSL-00044, twice per week at 50 gpm (24590-PTF-MVC-PVP-00010 and 24590-PTF-M5-V17T-00021001).

Table 2.13-4 Process Vessel Vent System Inorganic Constituent Decontamination Factors

PVP/PVV Equipment	Caustic Scrubber <sup>a,b</sup>	HEME <sup>a,b</sup>	HEPA <sup>b,c,d</sup>	Thermal Oxidizer Unit <sup>a,b</sup>	Carbon Bed Adsorber <sup>a,b</sup>
Constituent					
CO	1	1	1	1	1
CO <sub>2</sub>	1	1	1	1	1
H <sub>2</sub> O	1	1	1	1	1
NO	1	1	1	1	1
NO <sub>2</sub>	1.8	1	1	1	1
N <sub>2</sub>	1	1	1	1	1
O <sub>2</sub>	1	1	1	1	1
SO <sub>2</sub>	3	1	1	1	1
NH <sub>3</sub>	3	1	1	1	1
HNO <sub>3</sub>	3	1	1	1	1
HCl	3	1	1	1	1
HF	3	1	1	1	1
Ag <sup>+</sup>	3.5	200	1,667,000	1	1
Al <sup>+3</sup>	3.5	200	1,667,000	1	1
As <sup>+3</sup>	3.5	200	1,667,000	1	1
B <sup>+3</sup>	3.5	200	1,667,000	1	1
Ba <sup>+2</sup>	3.5	200	1,667,000	1	1
Bi <sup>+3</sup>	3.5	200	1,667,000	1	1
Ca <sup>+2</sup>	3.5	200	1,667,000	1	1
Cd <sup>+2</sup>	3.5	200	1,667,000	1	1
Ce <sup>+3</sup>	3.5	200	1,667,000	1	1
Cl <sup>-</sup>	3.5	200	1,667,000	1	1
CO <sub>3</sub> <sup>-2</sup>	3	200	1,667,000	1	1
Cr <sup>+3</sup>	3.5	200	1,667,000	1	1
Cu <sup>+2</sup>	3.5	200	1,667,000	1	1
F <sup>-</sup>	3.5	200	1,667,000	1	1
Fe <sup>+2</sup>	3.5	200	1,667,000	1	1
H <sup>+</sup>	---	---	---	---	---
H <sub>2</sub> O	---	---	---	---	---
Hg <sup>+2</sup>	1	1	1	1	1
K <sup>+</sup>	3.5	200	1,667,000	1	1
La <sup>+3</sup>	3.5	200	1,667,000	1	1
Li <sup>+</sup>	3.5	200	1,667,000	1	1
Mg <sup>+2</sup>	3.5	200	1,667,000	1	1

Table 2.13-4 Process Vessel Vent System Inorganic Constituent Decontamination Factors

PVP/PVV Equipment	Caustic Scrubber <sup>a,b</sup>	HEME <sup>a,b</sup>	HEPA <sup>b,c,d</sup>	Thermal Oxidizer Unit <sup>a,b</sup>	Carbon Bed Adsorber <sup>a,b</sup>
Mn <sup>+3</sup>	3.5	200	1,667,000	1	1
Na <sup>+</sup>	3.5	200	1,667,000	1	1
Ni <sup>+2</sup>	3.5	200	1,667,000	1	1
NO <sub>2</sub> <sup>-</sup>	3.5	200	1,667,000	1	1
NO <sub>3</sub> <sup>-</sup>	3.5	200	1,667,000	1	1
O <sup>-2</sup>	3.5	200	1,667,000	1	1
OH <sup>-</sup>	3.5	200	1,667,000	1	1
P <sup>+5</sup>	3.5	200	1,667,000	1	1
Pb <sup>+2</sup>	3.5	200	1,667,000	1	1
Pd <sup>+2</sup>	3.5	200	1,667,000	1	1
PO <sub>4</sub> <sup>-2</sup>	3.5	200	1,667,000	1	1
S <sup>+6</sup>	3.5	200	1,667,000	1	1
Si <sup>+4</sup>	3.5	200	1,667,000	1	1
SO <sub>4</sub> <sup>-2</sup>	3.5	200	1,667,000	1	1
Sr <sup>+2</sup>	3.5	200	1,667,000	1	1
Ti <sup>+4</sup>	3.5	200	1,667,000	1	1
Zn <sup>+2</sup>	3.5	200	1,667,000	1	1
Zr <sup>+4</sup>	3.5	200	1,667,000	1	1

a Reference 24590-WTP-RPT-PO-03-008, Rev 2, *Integrated Emissions Baseline Report for the Hanford Tank Waste Treatment and Immobilization Plant*.

b  $DF = \frac{\text{mass of constituent in incoming stream}}{\text{mass of constituent in exiting stream}}$

c Reference 24590-WTP-MKC-50-00002, Rev 1, *Process Equipment Decontamination Factor Curves*

d Reported DFs are for the combined primary and secondary HEPAs.

*If you change the pH from 12 to 9.5, these factors will be reduced.*

- 3.3.2 Total SOx removal efficiency of 97% is required with the scrubber reagent between pH9 and pH14.
- 3.3.3 Seller shall recommend the optimum rate of recirculation for the scrubbing solution.
- 3.3.4 Seller shall determine the optimum operating pH range for the scrubbing solution to achieve the required performance while minimizing generation of dissolved solids.
- 3.3.5 The overall offgas pressure drop across the scrubber shall not exceed the maximum allowable pressure drop specified in the MDS.
- 3.3.6 The flooding percentage of the packed bed shall not exceed 60% at the recirculation rate in section 3.3.3.
- 3.3.7 Seller shall recommend any additional operating parameters that must be monitored for the Scrubber to achieve the required performance.
- 3.3.8 Seller shall provide detailed operating instructions, in the form of a manual or similar document, describing how to operate the Scrubber for all conditions (startup, normal, abnormal, shutdown) to achieve the required performance.

#### 3.4 Design Conditions

- 3.4.1 Seller shall refer to the MDS for the allowable space envelope and design conditions of the LAW Melters Offgas Caustic Scrubber. Seller shall provide LAW Melters Offgas Caustic Scrubber dimensions as well as the dry, testing, and operating weights for the scrubber, and submit an updated MDS per Form G-321-E of the MR.
- 3.4.2 Deleted
- 3.4.3 Nozzle and manway design shall be in accordance with Reference 2.3.5. (Section 1.4 is not applicable.)
- 3.4.4 Nozzle loading and reinforcement requirements shall be in accordance with Reference 2.3.5 (Section 1.4 is not applicable.), and/or as specified on the MDS.
- 3.4.5 Lifting lug design shall be in accordance with Reference 2.3.12.
- 3.4.6 Tailing Lug design shall be in accordance with Reference 2.3.13.
- 3.4.7 Grounding lug design shall be in accordance with Reference 2.3.14.
- 3.4.8 Inspection manway design shall be in accordance with Detail 2 of Reference 2.3.18, Lifting eye shall be included for removal of the flange.
- 3.4.9 Deleted
- 3.4.10 Seller shall provide a nameplate for the Scrubber in accordance with Reference 2.3.19.

## CORROSION EVALUATION

**Assumptions and Supporting Justifications** (see References, Section 19)

- Operating conditions presented on the PCDS are conservative with respect to corrosion.<sup>11</sup>
- The PCDS states that the scrubber solution pH can be raised to 14 when high halide concentrations are measured in the scrubber bottom (Ref. 11, Section 6.6.3.1.14 included on page 13 of this document). While operating at pH 14 would not be deleterious to the scrubber materials of construction, such operations would significantly reduce the efficiency of the operations of the scrubber.<sup>1</sup> This statement will be removed from the PCDS at the next revision.
- The scrubber has provisions for process water addition during startup and to provide makeup water as necessary. A spray wash nozzle is also provided for wash down during maintenance periods.

**Operating Restrictions**

- To protect against localized corrosion in the vessel and transfer piping, develop procedure to bring the vessel aqueous contents within the limits defined for Type 316L in 24590-WTP-RPT-M-11-002, *WTP Materials Localized Corrosion Design Limits*, in the event that sampling indicates that temperature, pH, or chloride concentration exceeds those limits.
- Develop a work process to control, at a minimum, cleaning, rinsing, and flushing of vessel and internals, as applicable.
- Develop work process to control lay-up and storage; including during plant startup and during periods while the component is not in use once plant is operational.
- Procedures and work processes are to be reviewed and accepted by MET prior to use.

Concurrence                        
Operations                      

**REVISION HISTORY**

6	4/28/15	Complete re-write; no rev bars shown New format Incorporate revised PCDS Update references	DLAdler	TRangus	RBDavis	TErwin
5	9/25/13	Incorporate revised design temperature/pressure incorporate revised PCDS Editorial changes Changes do not reduce margin	DLAdler	RBDavis	NA	MWHoffmann
4	9/25/12	Incorporate revised PCDS Identify internals CA Extensive re-write; no rev bars shown Add'l Ops Limitation AEA Notice Update references	DLAdler	RBDavis	NA	DIWilsey
3	8/31/06	Update design temperature based on revised Mechanical Data Sheet Revise to require either Hastelloy C-276, or C-22, in place of Inconel 600 with stress relief heat treatment Remove section p Update wear allowance based on 24590-WTP-RPT-04-0008	DLAdler	HMKrafft	NA	SWVail
2	6/24/04	Incorporate new PCDS Clarify material recommendations for nozzles New section p – Inadvertent Addition of Nitric Acid	DLAdler	JRDivine	NA	APRangus
1	3/22/04	Update vessel description Update design temp/pressure Include material recommendation for nozzles and interior Remove reference to open issues Add DWP note	DLAdler	JRDivine	APR	APRangus
0	3/6/02	Initial Issue	JRDivine	DLAdler	NA	SMKirk
<b>REV</b>	<b>DATE</b>	<b>REASON FOR REVISION</b>	<b>PREPARER</b>	<b>CHECKER</b>	<b>MET</b>	<b>APPROVER</b>

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

This bound document contains a total of 15 sheets.

## CORROSION EVALUATION

### Corrosion/Erosion Detailed Discussion

The LAW Melters Offgas Caustic Scrubber is the final offgas abatement equipment in the secondary offgas treatment system. At this point in the process, the offgas is relatively clean as it has been processed through several stages of chemical and radiological abatement. In the Caustic Scrubber, high temperature offgas enters the scrubber near the bottom of the vessel. Four spray lances atomize water and spray it into the path of the incoming hot offgas. The majority of this spray is evaporated as it cools the incoming offgas. The offgas then flows vertically up through the vessel, through packing and mist eliminators, to the discharge near the top of the vessel. Countercurrent to this offgas flow, a high flow of scrubber solution is introduced above the vessel packing. This solution is broken into droplets that "rain" down through the packing, to the bottom of the scrubber. The countercurrent scrubber solution flow provides additional cooling and removes additional acid gases that may be present in the offgas stream. The aggressive constituents of concern are chlorides, fluorides, and SO<sub>x</sub>. The pH of the caustic solution will be maintained nominally at 9.5 through the addition of sodium hydroxide. The corrosion evaluation assumes all surfaces are wetted and that the scrubber solution flows through the packing, including the vessel side walls, to the bottom drain nozzle and out to the collection vessel for caustic addition prior to being pumped back into the scrubber above the packing.

Although rough estimates indicate the concentrations are well within the ability of the austenitic stainless steels, a high nickel alloy is recommended for the packing. The packing and the mist eliminator are designed to be periodically washed with water and ultimately replaced when the performance becomes degraded and cleaning is no longer effective. No corrosion allowance is required for the packing and mist eliminator (24590-WTP-GPG-M-047, *Design Guide: Preparation of Corrosion Evaluations*). The gas stream is not expected to contain solids, so sediment is not expected to accumulate on the bottom.

The evaluation of the upper portion of the scrubber is based on the temperature of the recirculated scrubber solution, 122 °F. According to the Mechanical Datasheet, 24590-LAW-MKD-LVP-00011, the temperature at Nozzle N06, the packing wash inlet, is expected to have a maximum temperature of 212 °F. It should be noted that the maximum temperature of the process service water received at N06 is 95 °F (24590-LAW-M6WX-LVP-00002002, *MS Line List for P&ID 24590-LAW-M6-LVP-00002002*).

### 1 General/Uniform Corrosion Analysis

#### a Background

General corrosion or uniform corrosion is corrosion that is distributed more-or-less uniformly over the surface of a material without appreciable localization. This leads to relatively uniform thinning on sheet and plate materials and general finning on one side or the other (or both) for pipe and tubing. It is recognized by a roughening of the surface and usually by the presence of corrosion products. The mechanism of the attack typically is an electrochemical process that takes place at the surface of the material. Differences in composition or orientation between small areas on the metal surface create anodes and cathodes that facilitate the corrosion process.

#### b Component-Specific Discussion

The scrubber is exposed to one offgas stream (LVP09) and one main fluid stream (LVP17) during normal operations. In this system, the pH of 9.5 and temperature of 122 °F indicate that Type 304L, Type 316L and higher alloys (including Hastelloy® C-22® and C-276) will be acceptable for most of the component. The maximum temperature at the scrubber bottom (412 °F) is such that either Hastelloy® C-276 or C-22® is recommended as a minimum for the lower shell. For Type 316L and the higher alloys, the expected uniform corrosion rate for 40 years, based upon a conservative value of 0.6 mpy, is 0.024 inches (24590-WTP-RPT-M-04-0008, *Evaluation Of Stainless Steel and Nickel Alloy Wear Rates In WTP Waste Streams At Low Velocities*). Dillon (2000) and Sedriks (1996) both state that the 300 series stainless steels are acceptable in up to 50% NaOH at temperatures up to about 122°F or slightly above. The usual corrosion rate for Type 304L in pure NaOH will be less than about 1 mpy up to about 212°F; although Sedriks states that the data beyond about 122°F are incorrect due to the presence of oxidizer contaminants, such as those contained in the waste.

### 2 Pitting Corrosion Analysis

Pitting is localized corrosion of a metal surface that is confined to a point or small area and takes the form of cavities. Chloride is known to cause pitting in acid and neutral solutions. The aqueous portion of the vessel is to operate at about 122 °F at a pH of 9 to 9.5, based on receipt of caustic scrubber solution recirculated from LVP-TK-00001. Pitting is not expected over the range of temperature and with water at a pH greater than 5. Long periods of stagnant conditions and no flow shall be avoided; procedures should be developed to ensure that materials are not compromised. If the vessel walls were wetted and left stagnant and the acid gas components concentrate by evaporation, there would be a tendency to pit. An operation limitation is provided to reduce the likelihood of corrosion initiation. According to section 6.3 of 24590-WTP-3YD-PSW-00001, *System Description for the Process Service Water System (PSW)*, water provided by the process service water (PSW) system is monitored for pH, chlorine concentration, and temperature.

The expected aqueous chemistry and temperature in this vessel fall within the limits for localized corrosion established for Type 316L in Table 1-2 and the limits for Hastelloy® C-22® (or C-276) in Table 1-4 of 24590-WTP-RPT-M-11-002, *WTP Materials Localized Corrosion Design Limits* report. Type 316L is not suitable for the expected gaseous temperatures above 200 °F that could exist in the bottom of the vessel below the packing. For the region that exceeds 200 °F, Hastelloy® C-276 or C-22® is recommended.

### 3 Crevice Corrosion Analysis

Crevice corrosion is a form of localized corrosion of a metal or alloy surface at, or immediately adjacent to, an area that is shielded from full exposure to the environment because of close proximity of the metal or alloy to the surface of another material or an adjacent surface of the same metal or alloy. Crevice corrosion is similar to pitting in mechanism; however, it can be initiated at lower temperatures. All welding uses butt welds and crevices in this vessel are limited by design and fabrication practice. There are no designed crevices in the pressure boundary; however, the packing, support structure and demister section have numerous crevices due to the crisscross "egg crate" design of the structure packing and the use of spot welds, which tend to create numerous crevices. The caustic scrubber design allows for the replacement of the packing. With the stated operating conditions, Type 316L is acceptable for the vessel pressure boundary above the packing. The packing is recommended to be fabricated using a higher nickel alloy which has greater crevice corrosion resistance.

## CORROSION EVALUATION

The expected aqueous chemistry and temperature in this vessel fall within the limits established for Type 316L in Table 1-2 of 24590-WTP-RPT-M-11-002 and the limits for Hastelloy® C-22® (or C-276) in Table 1-4 of 24590-WTP-RPT-M-11-002. Type 316L is not suitable for the expected high temperature gaseous conditions and is only recommended for the top head and shell. For the region that exceeds 200 °F, Hastelloy® C-276 or C-22® is recommended because the nickel-based alloys will perform better than AL-6XN®, Type 304L, and Type 316L in the high temperature conditions.

### 4 Stress Corrosion Cracking Analysis

Stress corrosion cracking (SCC) is the cracking of a material produced by the combined action of corrosion and sustained tensile stress (residual or applied). The exact amount of chloride required to cause SCC in alkaline solutions is unknown. In part, this is because the amount varies with temperature, metal sensitization, the environment, and also because chloride tends to concentrate under heat transfer conditions by evaporation, and electrochemically during a corrosion process. Generally, as seen in Sedriks (1996) and Davis (1987), stress corrosion cracking does not usually occur below about 140°F for sensitized alloys. With the proposed normal conditions, Type 304L and Type 316L are not expected to become sensitized. Therefore, SCC is not expected.

In the region of the scrubber where there is potential for high temperature, presence of acid gases, and the potential use of acid for cleaning, Hastelloy® C-276 or C-22® offer resistance to corrosion both at low pH from acid gas and high pH from the sodium hydroxide. These conditions fall within the design limits established for alloy C-22® in Table 1-4 of 24590-WTP-RPT-M-11-002. Further up the side walls when the temperature cools, the expected aqueous chemistry and temperature in this vessel fall within the limits established for Type 316L in Table 1-2 of 24590-WTP-RPT-M-11-002.

### 5 End Grain Corrosion Analysis

End grain corrosion is preferential aqueous corrosion that occurs along the worked direction of wrought stainless steels exposed to highly oxidizing acid conditions. End grain corrosion typically is not a major concern, it propagates along the rolling direction of the plate, not necessarily through the cross sectional thickness. In addition, end grain corrosion is exclusive to metallic product forms with exposed end grains from shearing or mechanical cutting. Conditions which lead to end grain corrosion are not present in this component; therefore, end grain corrosion is not a concern.

### 6 Weld Corrosion Analysis

The welds used in the fabrication will follow the WTP specifications and standards for quality workmanship. The materials selected for this fabrication are compatible with the weld filler metals and ASME/AWS practice. Using the welding practices specified for the project there should not be gross micro-segregation, precipitation of secondary phases, formation of unmixed zones, or volatilization of the alloying elements that could lead to localized corrosion of the weld. Assuming that correct weld procedures are followed, no preferential corrosion of weld beads or heat-affected zones occurs in the expected aqueous chemistry and temperature.

### 7 Microbiologically Influenced Corrosion Analysis

Microbiologically influenced corrosion (MIC) refers to corrosion affected by the presence or activity, or both, of microorganisms. Typically, with the exception of cooling water systems, MIC is not observed in operating systems. The proposed operating conditions are not conducive to microbial growth; the inlet temperature is too high, and the pH is generally too high. Rinsing with untreated process water may be a concern; the use of DIW is recommended. Conditions which lead to MIC are not present in this vessel.

### 8 Fatigue/Corrosion Fatigue Analysis

Corrosion-fatigue is the result of the combined action of cyclic stresses and a corrosive environment. The fatigue process is thought to cause rupture of the protective passive film, upon which stainless steel can actively corrode in the localized area of the film rupture. The corrosive environment may also act to reduce the stress necessary for film rupture. The result is that a metal exposed to a corrosive environment and cyclic mechanical load may initiate cracking at conditions at stress levels less than the endurance limit for the material.

The caustic scrubber is not cyclically operated; offgas flow is constant, steady and dry. Thermal cycles and therefore thermal stress is also low and associated with the start-up and shut down of the off gas system; according to the *LAW, BOF, and LAB VESSEL Cyclic Datasheet Inputs*, 24590-WTP-MVC-50-00009, the component is expected to experience 4200 thermal cycles during the design life. Based on the low mechanical and thermal cycling, corrosion fatigue will not be observed in the scrubber.

### 9 Vapor Phase Corrosion Analysis

Conditions in the vapor phase and at the vapor/liquid interface can be significantly different than those present in the liquid phase. The entire vessel that is exposed to the offgas vapor phase will be periodically flushed. Type 316L is the minimum alloy acceptable for this service in the low temperature region, while alloy C-22® or C-276 is suitable for the high temperature region.

In alkaline conditions, vapor-phase corrosion in Type 316L is less than 0.001 mpy and corrosion rates in C-22, C-276 and other nickel-based alloys are shown to be lower (Rozeveld and Chamberlain).

## CORROSION EVALUATION

corrosion allowance in all other cases is 0.04 inch. Based on the expected operating conditions at high pH, Type 316L is expected to be satisfactorily resistant to localized corrosion and is suitable for the vessel upper shell (lower temperature region). In the region of the scrubber where there is potential of for high temperature, and the presence of acid gases, Hastelloy® C-276 or C-22® offer resistance to corrosion both at low pH from acid gas and high pH from the sodium hydroxide. Further up the side walls where the temperature cools, type 316L stainless steel is appropriate. Conditions which lead to end grain corrosion, weld corrosion, MIC, and creep are not present in this system. Conditions which lead to fatigue or corrosion fatigue, vapor phase corrosion, galling, fretting, galvanic corrosion, and cavitation are not present in this component by design.

The recommended corrosion allowance provides sufficient protection for erosion of the vessel wall.

### 18 Margin

The system is designed with a uniform corrosion allowance of 0.04 inch based on the range of inputs, system knowledge, handbooks, literature, and engineering judgment/experience. The service conditions used for materials selection has been described above and results in a predicted uniform loss due to corrosion and erosion of 0.028 inch. The specified minimum corrosion allowance (0.040 inch) exceeds the minimum required corrosion allowance (0.028 inch) thus establishing a design margin. The uniform corrosion design margin for the operating conditions is sufficient to expect 40 year operating life of the scrubber (excludes the packing and mist eliminators which are planned to be replaced over the life of the plant) and is justified in the referenced calculations.

Localized erosion of this component is not expected. Prior to reaching the caustic scrubber, the offgas passes through a variety of equipment that will render the inlet streams particulate free. Since localized erosion effects are not present, additional localized corrosion protection is not required.

The maximum operating parameters for this vessel are defined in the PCDS. As shown in the table below, the PCDS reported pH, chemistry, and temperature are bounded by the materials localized corrosion design limits. The aqueous normal operating constituent concentrations and operating conditions are within the range allowed in the *WTP Materials Localized Corrosion Design Limits* report. The difference between the design limits and the operating maximum (PCDS values) is the localized corrosion design margin and, based on the operating conditions, is sufficient to expect a 40 year operating life. The LAW Melter Offgas Caustic Scrubber, LVP-SCB-00001, is protected from localized corrosion (pitting, crevice, and stress corrosion cracking) by operating within the acceptable range of the design limits. Operational and process restriction will be used to ensure the limits are maintained.

<b>MATERIALS LOCALIZED CORROSION DESIGN LIMITS – Type 316L</b>			
	<u>Temperature (°F)</u>	<u>pH</u>	<u>Chloride (ppm)</u>
<b>DESIGN LIMIT</b>	150 max	5 to 10	300 max
Caustic scrub solution to LVP-TK-00001 (LVP17) Note 1	122	9.5	51
<b>Inlet Vessels to LVP-SCB-00001</b>			
	<u>Temperature (°F)</u>	<u>pH</u>	<u>Chloride (ppm)</u>
Caustic scrub solution from LVP-TK-00001 (LVP17) Note 2	122	9.5	51

<b>MATERIALS LOCALIZED CORROSION DESIGN LIMITS – Hastelloy® C-22®</b>			
		<u>pH</u>	<u>Chloride (ppm)</u>
<b>DESIGN LIMIT</b>		5 to 10	30,000 max
Caustic scrub solution to LVP-TK-00001 (LVP17) Note 1		9.5	51
<b>Inlet Vessels to LVP-SCB-00001</b>			
		<u>pH</u>	<u>Chloride (ppm)</u>
Caustic scrub solution from LVP-TK-00001 (LVP17) Note 2		9.5	51

The comparisons in these tables covers only the aqueous portion of the vessel. Offgas conditions were not evaluated in 24590-WTP-RPT-M-11-002, the source of the design limits. For the purposes of corrosion resistance, C-22® and C-276 alloys can be considered similar, and the same material localized corrosion design limits apply.

Notes:

- 1) LVP-SCB-00001 (aqueous) process stream LVP17 – 24590-WTP-RPT-PR-04-0001-04, Figure C-36
- 2) LVP-TK-00001 process stream LVP17 – 24590-WTP-RPT-PR-04-0001-04, Figure C-38

## CORROSION EVALUATION

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## 6.6.3.1.13 LVP09 - Offgas from LVP-SCR-00001 via LVP-HX-00001 to LVP-SCB-00001

This stream is the offgas from the selective catalytic reducer via the heat exchanger to the scrubber.

Molarity

N/A

Temperature

The temperature will normally be 370°F (24590-LAW-M4E-LOP-00009, pg. 11, Cell Q45, Ref. 7.1.4(13)). The maximum temperature is 412°F (24590-LAW-M4E-LOP-00009, pg. 15, Cell Q45, Ref. 7.1.4(13)).

Solids Concentration

The solids concentration will normally be near zero or trace solids.

Vapor Density

The vapor density will normally be 3.27E-2 lb/ft<sup>3</sup> to 2.84E-2 lb/ft<sup>3</sup> (24590-LAW-M4E-LOP-00009, pg. 11, Cell AI44; pg. 15, Cell AI44, Ref. 7.1.4(13)).

Liquid pH

N/A

## 6.6.3.1.14 LVP17 - Caustic Scrub Solution from LVP-TK-00001 to LVP-SCB-00001

Stream LVP17 is the caustic scrubber solution recirculating from LVP-TK-00001 to LVP-SCB-00001.

Molarity

The normal sodium molarity range of the caustic scrubber solution from LVP-TK-00001 is 1.78-1.89 molar Na (24590-WTP-M4C-V11T-00024, Ref. 7.1.4(30)). Note that 5M NaOH is added to the scrubbing solution to neutralize the acid gases collected in the caustic collection tank LVP-TK-00001 and maintain the pH value of the scrubbing solution. The resulting sodium molarity for this stream will be provided in the corrosion data sheet.

Temperature

The minimum temperature of the caustic scrubber solution from LVP-TK-00001 is 59°F based on the minimum temperature of the C3 area (24590-WTP-DB-ENG-01-001, Ref. 7.1.1(2), Table 12-1). The normal and maximum temperature of the caustic scrubber solution from LVP-TK-00001 is 122°F based on the scrubber solution temperature in equilibrium with the scrubber exit offgas temperature (24590-LAW-MEC-LVP-00003, Ref. 7.1.4(14), Section 6.14).

Solids Concentration

The solids concentration for the caustic scrubber solution from LVP-TK-00001 is negligible (24590-WTP-DB-PET-09-001, Ref. 7.1.1(3), Appendix B, Table B-23).

Liquid Density

Process service water is added to the caustic scrubber solution to maintain the scrubber solution below 10wt% dissolved solids (24590-LAW-MEC-LVP-00003, Ref. 7.1.4(14), Section 2.4). The maximum density of the caustic scrubber solution is 68.6 lb/ft<sup>3</sup> (24590-LAW-MEC-LVP-00003, Ref. 7.1.4(14), Section 2.30)

Liquid pH

The pH of the scrubber solution is continuously monitored and normally maintained in the range of 9.0 to 9.5 (24590-LAW-MTC-LVP-00002, Ref. 7.1.4(19), Section 8). The scrubber solution pH can be raised to 14 when high halide concentrations are measured in the scrubber bottom to control 316L stainless steel corrosion rates (24590-LAW-MKD-LVP-00011, Ref. 7.1.5(4), pg.10, Note 2).



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**MECHANICAL DATA SHEET**  
**LAW Melter Offgas Caustic**  
**Scrubber**

PLANT ITEM No.

24590-LAW-MK-LVP-SCB-00001

Data Sheet No.

24590-LAW-MKD-LVP-00011

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**Process Conditions (Ref 2 unless noted otherwise)**

Process Condition	Operating		Remarks	
	Unit	Normal		Max.
<b>INLET OFFGAS, Nozzle N01</b>				
Flow Type		Continuous	Continuous	
Phase		Gas	Gas	
Actual Flowrate	ACFM	8322	9803	
Temperature	°F	370	412	
Pressure	Inches water gage	-111	-135	-135 in wg = -4.9 psig
<b>Volumetric Process Concentration</b>				
N <sub>2</sub>	Vol %	70	70	
O <sub>2</sub>	Vol %	18	18	
H <sub>2</sub> O	Vol %	10	11	
CO <sub>2</sub>	Vol %	1	1	
Ar	Vol %	1	1	
<b>Process Concentration</b>				
Organic	lb/hr	6.20E-02	1.29E-01	
H <sub>2</sub> O	lb/hr	1.03E+03	1.17E+03	
CO	lb/hr	3.50E-01	1.20E+00	
CO <sub>2</sub>	lb/hr	2.94E+02	3.71E+02	Ref 29
HCl	lb/hr	1.49E-02	1.89E-02	Ref 29
HF	lb/hr	2.92E-03	7.37E-03	Ref 29
NH <sub>3</sub>	ppmv	251	339	Ref 29
NO	lb/hr	6.58E-01	9.35E-01	
NO <sub>2</sub>	lb/hr	8.73E-01	1.73E+00	
SO <sub>2</sub>	lb/hr	6.95E-02	1.35E-01	
SO <sub>3</sub>	lb/hr	1.39E-05	1.57E-05	Ref 29
<b>OUTLET OFFGAS, Nozzle N02</b>				
Flow Type		Continuous	Continuous	
Phase		Gas	Gas	
Actual Flow rate	ACFM	6894	8156	
Temperature	°F	122	122	
Pressure	Inches water gage	-124	-154 (Ref 27)	-154 in wg = -5.6 psig
<b>CONDENSATE DISCHARGE, Nozzle N03</b>				
Flow Type		Continuous	Continuous	
Phase		Liquid	Liquid	
Actual Flow rate (note 7)	gal /min	200	200	
Pressure	Inches water gage	-111	-135	
Viscosity	cP	0.43	0.43	
pH (note 7)				



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**MECHANICAL DATA SHEET**  
**LAW Melter Offgas Caustic**  
**Scrubber**

**PLANT ITEM No.**  
**24590-LAW-MK-LVP-SCB-00001**

<b>Data Sheet No.</b>	<b>Rev.</b>
<b>24590-LAW-MKD-LVP-00011</b>	<b>6</b>

**Process Conditions (Ref 2 unless noted otherwise)**

Process Condition	Operating			Remarks
	Unit	Normal	Max.	
<b>CONDENSATE RECIRCULATION, Nozzle N04</b>				
Flow Type		Continuous	Continuous	
Phase		Liquid	Liquid	
Actual Flow rate (note 7)	gal/min	200	200	
Temperature	°F	122	122	Equilibrium with outlet offgas
Pressure	psig	44	44	
Viscosity	cP	0.43	0.43	
pH (note 7)				
<b>QUENCH INLET SPRAY, Nozzles N07A thru D (note 5)</b>				
Actual Flow rate (liquid) per nozzle (note 7)	gal/min	1.5	2.2	
Liquid pressure (at vessel nozzle) (note 7)	psig	58	58	Ref 25
PSW wash supply temperature	°F	60	60	Ref 28
Actual Flow rate (air) per spray nozzle (note 7)	std ft <sup>3</sup> /min	26	36	
Air pressure (at vessel nozzle) (note 7)	psig	60	60	
<b>Demister Wash, Nozzles N51-N54 &amp; N51A-N54A</b>				
Wash Frequency (note 7)	Weeks	1	1	
Wash Duration (note 7)	Minutes	5	5	
Wash Flow Rate, per spray nozzle (note 7)	gal/min	4	4	
Wash Supply Press., at vessel nozzle (note 7)	psig	40	45	Ref 25
PSW wash supply temperature	°F	60	60	Ref 28
<b>Packing Wash Lower, Nozzle N06</b>				
Wash Frequency (note 7)	Weeks	1	1	
Wash Duration (note 7)	Minutes	5	5	
Wash Flow Rate, per spray nozzle (note 7)	gal/min	4	4	
Wash Supply Pressure, at vessel nozzle (note 7)	psig	40	49	Ref 25
PSW wash supply temperature	°F	60	60	Ref 28

Design	Unit	Criteria
Design Basis minimum removal efficiency	%	97 (Ref 14)
Design Basis Component		SO <sub>x</sub> (SO <sub>2</sub> + SO <sub>3</sub> )
Maximum Flooding	%	60 (Ref 14)
Packing Height Contingency	%	10



River Protection Project  
Waste Treatment Plant

**MECHANICAL DATA SHEET**  
**LAW Melter Offgas Caustic**  
**Scrubber**

**PLANT ITEM No.**

**24590-LAW-MK-LVP-SCB-00001**

**Data Sheet No.**

**24590-LAW-MKD-LVP-00011**

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<b>PROCESS WATER (PSW)</b>			
PSW Source		Domestic water (DOW) provided by DOE. (Ref 19)	
<b>Water Quality Summary: (Ref 20)</b>			
<b>Constituents -</b>	<b>Annual Average Value -</b>	<b>Seasonal / Design Average Value -</b>	<b>Units -</b>
Carbon tetrachloride	< 1	N/A	µg/L
Methylene chloride	< 1	N/A	µg/L
Bromoform	< 0.5	< 0.5	µg/L
Bromodichloromethane	2.1	3.3	µg/L
Chloroform	37	61	µg/L
Dibromochloromethane	< 0.5	< 0.5	µg/L
Total trihalomethanes	43	65	µg/L
Bis(2-ethylhexyl) phthalate	< 1	N/A	µg/L
<b>Metals -</b>			
Arsenic	0.58	N/A	µg/L
Cadmium	0.026	N/A	µg/L
Chromium	0.12	N/A	µg/L
Lead	0.048	N/A	µg/L
Mercury	0.00033	N/A	µg/L
Iron	20	N/A	µg/L
Manganese	< 10	N/A	µg/L
<b>Anions -</b>			
Chloride	3.4	N/A	mg/L
Nitrate	0.11	0.14	mg/L as N
Sulfate	26	N/A	mg/L
<b>Other Analyses -</b>			
Total Dissolved Solids	100	120	mg/L
pH	7.0	N/A	S.U.
<b>Radionuclides -</b>			
Gross Alpha	0.51	N/A	pCi/L
Gross Beta	0.49	N/A	pCi/L
Tritium	154.7	N/A	pCi/L

**Process Condition Notes:**

- (1). Deleted
- (2). Deleted
- (3). Deleted
- (4). Deleted
- (5). Cooling duty from vaporization of process service water sprayed into scrubber column.
- (6). Deleted
- (7). **Supplier to verify or supply for operating conditions.**

Design Basis  
Unknown.

Information Assessed	Source of Information	Assessment
<p><b>Design (cont'd)</b></p> <p>If a non-standard Plant Item is to be used, the design calculations demonstrate sound engineering principles of construction.</p>	<p>Material Requisition, Engineering Specifications, Mechanical Data Sheet (MDS), and Drawings listed above under References;</p> <p>ASME Boiler and Pressure Vessel Code (B&amp;PV), Section VIII, Division I, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers;</p> <p>24590-LAW-MVC-LVP-00003, Rev. B, LVP-SCB-00001, LAW Melters Offgas Caustic Scrubber, Stress Analysis with ANSYS (Design Calculation);</p> <p>24590-QL-POA-MKAS-00003-07-00005, Rev. 00D, LAW Caustic Scrubber ASME Code Calculation (Design Calculation);</p> <p>24590-WTP-MVC-50-00009, Rev. 0, LAW, BOF, and LAB Vessel Cyclic Datasheet Inputs (Design Calculation);</p> <p>24590-LAW-DDC-S13T-00058, Rev. D, Anchor Bolt and Embed Design for Caustic Scrubber (LVP-SCB-00001) at El. +49'-0" (Design Calculation).</p>	<p>The LAW MU (LVP-SCB-00001) in the LAW Secondary Off-gas System (LVP) is a non-standard offgas treatment assembly that is shop fabricated. The referenced Material Requisition, MDS, and Specifications require that this vessel be designed and built using ASME B &amp; PV Code, Section VIII, Div. 1 and delivered after design, fabrication, inspection, and testing including ASME code stamp with National Board registration number. Review of the listed Analysis/Design Calculations and drawings show that appropriate applicable load cases and combinations thereof were used utilizing sound engineering principles for the design and construction of the Scrubber. Furthermore, approval and acceptance of the vendor fabrication drawings (including various applicable change notices) by Bechtel National Inc.(BNI), is an added assurance that all applicable requirements stated above and as described in documents (including daughter documents) listed in the Material Requisition for the vessel, have been met. The BNI approved and accepted change notices documents were reviewed and found to be in compliance with the applicable design requirements.</p>

REV B AND REV D  
 ARE NOT FINAL Design Documents

Information Assessed	Source of Information	Assessment
<p><b>Design (cont'd)</b></p> <p>If a non-standard Plant Item is to be used, the design calculations demonstrate sound engineering principles of construction.</p>	<p>Material Requisition, Mechanical Data Sheet, Specifications, and Drawings listed above under References;</p> <p>ASME Boiler and Pressure Vessel Code (B&amp;PV), Section VIII, Division 1 &amp; 2, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers;</p> <p>ASME B31.3 Code, Process Piping, American Society of Mechanical Engineers;</p> <p>AISC N690, American National Standard-Nuclear Facilities-Steel Safety Related Structures for Design, Fabrication, and Erection, American Society of Steel Construction;</p> <p>AISC M016, Manual of Steel Construction, ASD 9<sup>th</sup> Edition, American Society of Steel Construction;</p> <p>AWS 1.1, Structural Welding Code-Steel, American Welding Society;</p> <p>AWS 1.6, Structural Welding Code-Stainless Steel; American Welding Society;</p> <p>UBC 1997, Uniform Building Code.</p> <p>24590-WTP-DC-ST-01-001, Rev. 13, Structural Design Criteria;</p> <p>ASTM Standards, American Society for Testing and Materials.</p> <p>24590-LAW-MVC-LVP-00004, Rev. A, LVP-SKID-00002, LAW Thermal Catalytic Oxidizer / Reducer, Stress Analysis with ANSYS, including ECCN # 24590-LAW-MVE-LVP-00001.</p>	<p>The LAW LVP TCO Unit is a non-standard offgas treatment assembly that is shop fabricated. The referenced Material Requisition, Mechanical Data Sheet, and Specifications require that the TCO Unit be designed, fabricated, inspected, tested, and installed per the applicable codes, standards, and design criteria listed in the Source of Information column herein. Review of the TCO Stress Analysis and drawings show that appropriate applicable load cases and combinations thereof were used utilizing sound engineering principles for the design and construction of the TCO Unit. Furthermore, approval and acceptance of the vendor fabrication drawings by Bechtel National Inc. (BNI), is an added assurance that all applicable requirements stated in aforementioned documents (including daughter documents) for the TCO Unit have been met.</p> <p><i>Not Final Des. sh.</i></p> <p><i>On 4 places</i></p>

Information Assessed	Source of Information	Assessment
<p>Waste Characteristics</p> <p>Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, storage temperature)</p>	<p>LETTER REV IS NOT FINAL DESIGN.</p> <p>System Description, Mechanical Data Sheet, and Corrosion Evaluation listed above under References;</p> <p>24590-WTP-PER-PR-03-002, Rev. 3, Control of Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Unit Systems; 24590-WTP-M4C-VIIT-00004, Rev. C, Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP. 24590-LAW-M4C-LOP-00001, Rev. 3, LAW Melter Offgas System Design Basis Flowsheets, including ECCN # 00003 and 00009; CCN 280210, LAW Miscellaneous Treatment Unit Hydrogen Accumulation Documentation for the DWP Administrative Record.</p> <p>SAME FILE AS 24590-LAW-M4E-LOP-00009</p>	<p>The Mechanical Data Sheet presents the operating temperatures and pressures for the TCO Unit. The Corrosion Evaluation documents address the chemical composition of the offgas in order to select appropriate TCO Unit materials and specify the corrosion allowance. The System Description document identifies the offgas being handled by the TCO Unit as hazardous, but not as ignitable or flammable. The main function of the TCO Unit is to prevent the escape of toxic and hazardous gas vapors to the environment from the LAW offgas system. The TCO Unit design is required to provide an intact housing pressure boundary during normal and abnormal operations and during and after design level seismic events. Waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are appropriately addressed in the Control of Toxic Vapors and Emissions, Calculation of Hydrogen Generation Rates, Melter Offgas System Design Basis Flowsheets, and CCN 280210 documents. The System Description and the Control of Toxic Vapors and Emissions documents describe that the LAW TCO Unit remove volatile organic compounds (VOCs) and nitrogen oxides (NO<sub>x</sub>) compounds from the LAW offgas LVP exhaust system. Review of the Calculation for Hydrogen Generation Rates, Melter Offgas System Design Basis Flowsheets, and CCN 280210 documents show that this miscellaneous TCO Unit does not pose any hydrogen generation or accumulation hazard.</p>
<p>Plant Item is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.</p>	<p>Corrosion Evaluation, Mechanical Data Sheet, and System Description listed above under References.</p>	<p>The Corrosion Evaluation documents and the Mechanical Data Sheet adequately demonstrate incorporation of identified waste characteristics into the TCO Unit design. Normal and abnormal operating conditions are discussed in the System Description document. The offgas passing thru the SCR catalyst unit is injected with ammonia vapors and C3 air from the ammonia/air dilution skid (LVP-SKID-00003) housing the dilution fans (LVP-FAN-00001/00002) and a mixing chamber.</p>

Data	Document #	Rev	Document Title
Quality Level	24590-LAW-M6-LVP-00005001	3	<i>P&amp;ID – LAW Secondary Offgas/Vessel Vent Process System Ammonia Dilution Skid</i>
	24590-LAW-M6-LVP-00005002	3	<i>P&amp;ID-LAW-Secondary Offgas/Vessel Vent Process System SCO/SCR Skid</i>
Seismic Category	24590-LAW-M6-LVP-00005001	3	<i>P&amp;ID – LAW Secondary Offgas/Vessel Vent Process System Ammonia Dilution Skid</i>
	24590-LAW-M6-LVP-00005002	3	<i>P&amp;ID-LAW-Secondary Offgas/Vessel Vent Process System SCO/SCR Skid</i>
2 Melter Maximum Flow Rate	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
Design Volumetric Flow Rate	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 9</i>
2 Melter Nominal Inlet Temperature	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
2 Melter Maximum Inlet Temperature	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
Design Inlet Temperature	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 15</i>
Maximum Outlet Temperature	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 3</i>
Design Outlet Temperature	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
2 Melter Nominal Pressure	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
2 Melter Maximum Pressure	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 7</i>
Design Inlet Pressure (Vacuum)	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 8</i>
Allowable Differential Pressure (Nominal)	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 11</i>
Allowable Differential Pressure (Maximum)	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 15</i>
Allowable Differential Pressure (Design)	24590-LAW-MKC-LVP-00003	1	<i>LAW Catalytic Oxidizer/Reducer Skid Inlet Operating Conditions and Design Requirements, page 9</i>
2 Melter Maximum Mass Flow	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 15</i>
2 Melter Maximum Density	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 15</i>
2 Melter Nominal Mass Flow	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 11</i>
2 Melter Nominal Density	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 11</i>
2 Melter Nominal Volumetric Flow	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Page 11</i>
2 Melter Nominal Offgas Composition	24590-LAW-M4E-LOP-00009	N/A	<i>LAW Melter Offgas System Design Basis Flow Sheets, Pages 12-14</i>

#### 3.3.3.8.1 Design Data - Catalytic Oxidizer Electric Heater

- Provide enough power to raise the offgas temperature to 750 °F
- Pressure differential: 2.5 mbar
- Line pressure drop from the heater to the VOC catalyst: 0.2 mbar

#### 3.3.3.8.2 Operating Logic - Catalytic Oxidizer Electric Heater

The heater is operated as necessary to maintain temperature. The heater load is greatest during startup and when the NO<sub>x</sub> feed concentration is low. Exothermic reactions may provide enough heat to reduce or eliminate the need for heating.

#### 3.3.3.8.3 Energy Contributions - Catalytic Oxidizer Electric Heater

Electrical power: enough power is provided to the heater to raise the temperature to the catalyst beds' operating temperature of 750 °F. The amount of power supplied depends on the cold side outlet temperature of the heat exchanger immediately upstream of the heater.

#### 3.3.3.8.4 Services - Catalytic Oxidizer Electric Heater

Electrical power: enough power is provided to the heater to raise the catalyst beds' operating temperature to 750 °F.

#### 3.3.3.8.5 Chemistry - Catalytic Oxidizer Electric Heater

None.

### 3.3.3.9 Thermal Catalytic Oxidizers

Oxidation of VOC and CO is the next step in the catalytic unit after heating. The thermal catalytic oxidizer (TCO) column (LVP-SCO-00001) is placed at the beginning of the unit. The oxidation is exothermic. Through this catalyst the organics are generally oxidized to carbon dioxide, hydrogen chloride (if chlorinated compounds are present), and water vapor. Trace amounts of fluoride, bromide, and iodide may also be present in the oxidizer exhaust, depending on the organic compound oxidized.

Pertinent design and operating parameters for this unit include the following.

#### 3.3.3.9.1 Design Data - Thermal Catalytic Oxidizers

(24590-LAW-MAC-LVP-00007, 24590-LAW-MKD-LVP-00012)

- Organic removal efficiency: 95 % (DF = 20)
- The expected DFs for each component are in Table 3.3-4
- Required operating inlet temperature: 650 °F (343 °C) minimum
- Pressure drop across the bed: 5 mbar
- Line pressure drop from the bed to the SCR: 3 mbar

Table 3.3-4 LAW Secondary Offgas System Decontamination Factors

Components	DF HEPA (First) Nominal	Source	DF HEPA (Second) Nominal	Source	DF Thermal Oxidizer	Source	DF NOx SCR	Source	DF Caustic Scrubber	Source	DF Mercury Adsorp. Column	Source
PO43-	3333	18	500	18	1	20	1	22	1	9	1	9
SiO4-4	3333	18	500	18	1	20	1	22	1	24	1	24
SO42-	Table 3.3-3	-	Table 3.3-3	-	1	20	1	22	1	9	1	9
acetate	3333	19	500	19	20	20	1	22	1	24	1	24
oxalate	3333	19	500	19	20	20	1	22	1	24	1	24
citrate	3333	19	500	19	20	20	1	22	1	24	1	24
EDTA	3333	19	500	19	20	20	1	22	1	24	1	24
formate	3333	19	500	19	20	20	1	22	1	24	1	24
glycolate	3333	19	500	19	20	20	1	22	1	24	1	24
HEDTA	3333	19	500	19	20	20	1	22	1	24	1	24
IDA	3333	19	500	19	20	20	1	22	1	24	1	24
Sucrose	3333	18	500	18	20	20	1	22	1	9	1	9
PPG	3333	30	500	30	20	20	1	22	1	24	1	24
PDMS	3333	30	500	30	20	20	1	22	1	24	1	24
C12H4C16(l)	3333	1	500	1	20	1	1	1	1	1	1	1
C2H3N(l)	3333	1	500	1	20	1	1	1	1	1	1	1
C12H4C16(g)	3333	1	500	1	20	1	1	1	1	1	1	1
C2H3N(g)	3333	1	500	1	20	1	1	1	1	1	1	1
H2O	1	18	1	18	1	20	1 & produced	22	calculated	9	1	9
CO	1	18	1	18	20	20	1	22	1	9	1	9
CO2	1	18	1	18	1	20	1	22	1.02	10	1	9
HCl	Table 3.3-3	-	Table 3.3-3	-	1	20	1	22	100	9	33.3	26
HF	Table 3.3-3	-	Table 3.3-3	-	1	20	1	22	100	9	33.3	26
HI	Table 3.3-3	-	Table 3.3-3	-	NA		NA		NA		NA	
I2	Table 3.3-3	-	Table 3.3-3	-	1	20	1	22	100	9	100	26
N2	1	18	1	18	1	20	1 & produced	22	1	9	1	9
NH3	1	18	1	18	1	20	consumed	22	1.4	28	1	9
NO	1	18	1	18	1	20	50	21	1	9	1	9
NO2	1	18	1	18	1	20	50	21	1.04	10	1	9
O2	1	18	1	18	1	20	1	22	1	9	1	9
P2O5(s)	3333	18	500	18	1	20	1	22	1	9	1	9
SO2	Table 3.3-3	-	Table 3.3-3	-	1.25	20	1	22	33.3	25	1	9

NOx



River Protection Project  
Waste Treatment Plant

**MECHANICAL DATA SHEET**  
**LAW Catalytic Oxidizer / Reducer**

**PLANT ITEM No.**

**24590-LAW-MX-LVP-SKID-00002**

**24590-LAW-MX-LVP-SKID-00003**

**(General Note 2)**

**Data Sheet No.**

**24590-LAW-MKD-LVP-00012**

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**General Notes**

1. Seller to confirm values and specify specific model numbers for components listed.
2. LVP-SKID-00002 is the catalytic oxidizer/ reducer unit, and is made up of sub component tag numbers:
  - 24590-LAW-LVP-HX-00001
  - 24590-LAW-LVP-HTR-00002
  - 24590-LAW-LVP-SCO-00001
  - 24590-LAW-LVP-SCR-00001
- LVP-SKID-00003 is the ammonia supply and air dilution equipment and piping, and includes sub component tag numbers:
  - 24590-LAW-LVP-FAN-00001 & 00002
  - Deleted
  - Deleted
  - 24590-LAW-LVP-HEPA-00004A/B
  - Deleted
3. Data marked with an asterisk \* is, or will be, provided by Seller.
4. Equipment on LVP-SKID-00002 is Dangerous Waste Permit Affecting.
5. Deleted
6. Ammonia supply design pressure shall be applied to the design of the dilution air piping, up to and including valve YV-0538, and to the combined ammonia/air piping up to nozzle N04.
7. Equipment location is shown on Drawings 24590-LAW-P1-P23T-00051 and 24590-LAW-P1-P23T-00052.
8. Oxidation catalyst residence time is based on pilot plant performance at the Catholic University's Vitreous State Laboratory (VSL). Reference: Regulatory Off-Gas Emissions Testing on the DMI200 Melter System Using HLW and LAW Simulants, 24590-101-TSA-W000-0009-166-00001.
9. Organic loading is based on pilot plant performance at the Catholic University's Vitreous State Laboratory (VSL). Reference Regulatory Off-Gas Emissions Testing on the DMI200 Melter System Using HLW and LAW Simulants, 24590-101-TSA-W000-0009-166-00001 and Small Scale Melter Testing for Allyl Alcohol Method Verification, 24590-101-TSA-W000-0009-195-00002.
10. Deleted
11. Reference Corrosion Evaluations, 24590-LAW-N1D-LVP-00005, -00006, -00007 and -00008. No corrosion allowance for heating elements. Heaters are designed for replacement. Expected life of the heaters is nominally 5 years.



River Protection Project  
Waste Treatment Plant

**MECHANICAL DATA SHEET**  
**LAW Catalytic Oxidizer / Reducer**

PLANT ITEM No.

24590-LAW-MX-LVP-SKID-00002

24590-LAW-MX-LVP-SKID-00003

(General Note 2)

Data Sheet No.

24590-LAW-MKD-LVP-00012

Rev.

15

11	<p>Revised the skid height, removed the conceptual design information, deleted component tag numbers, revised the quality level in General Note 5, updated the EQ data sheet to the latest version, added reference list, removed the nozzle loads from the technical notes and added them to the data sheet, added 20% to the nozzle loads per email from Grant Goolsby dated 6/19/14 – CCN: 270007. Major revision, triangles not used for clarity, Margin is not affected. This datasheet summarizes technical data developed in calculations and reports or documented in design basis documents. These documents contain the margin.</p>	Mike O'Neil	D Ricketson	G Goolsby	N/A	Dick Hills	Stuart Kretschmar	10/21 /14
10	<p>No margin analysis justification is required because these changes do not reduce or eliminate margin (ref. CCN 222685). Revision triangles used. Added technical justification to process note 10. Increased overall length and width due to analyzer probe nozzle addition. Clarified reference points for TCO inlet/outlet height measurement. Revised North arrow for ammonia skid layout. Deleted FILT-00001 from general note 2. Revised section 4.4.3.1. Revised EQD, Section 20. Mounting Method. No margin justification is required because these changes do not reduce or eliminate margin. (Ref. CCN 222685). Revised the Offgas Outlet Minimum Temperature.</p>	M. O'Neil No Comments per email dated 2/24/13	J. Marsh	S. Edwards	D. Krahn Comments resolved per email dated 6/14/13	D. Hills No Comments per email dated 2/12/13	Peter Ornel	6/19 /13
9	<p>Revision triangles used. Complete rewrite of the EQD into the new form. Allowable differential pressure has decreased. However, the SELLER indicates the allowable differential pressures are unattainable. Specified inlet/outlet nozzle height. Increased the allowable envelope and shipping height of the Ammonia/Air Dilution Skid per Seller request. Increased the allowable length of the TCO Skid. Decreased Offgas Outlet Design Temperature. Incorporated TCO nozzle design loads to reflect TCN 24590-QL-MRA-MBT0-00007-T0006. Decreased Abnormal High Temp and DBE High Temp per 24590-LAW-M0E-M40T-00007.</p>	M. O'Neil	D. Nelson	J. Wood	D. Krahn	R. Mills	D. Milden	07-24-12

Information Assessed	Source of Information	Assessment
<p><b>Design (cont'd)</b></p> <p>Plant Item has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.</p>	<p>Specifications, Mechanical Data Sheet, and Material Requisition listed above under References;</p> <p>ASME Boiler and Pressure Vessel (B&amp;PV) Code, Section VIII, Div. 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers;</p> <p>ASME Boiler and Pressure Vessel (B&amp;PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers;</p> <p>ASME B 16.5, Pipe Flanges and Pipe Fittings Standard, American Society of Mechanical Engineers;</p> <p>ASME B31.3, Process Piping, ASME Code for Process Piping, American Society of Mechanical Engineers;</p> <p>NFPA 70, National Electrical Code, NFPA-70-1999).</p> <p>UBC 1997, Uniform Building Code, International Conference of Building Officials;</p> <p>24590-LAW-NID-LVP-00009, Rev. 1, Corrosion Evaluation for LAW Melter Offgas HEPA Pre-heaters (LVP-HTR-00001A/B and -00003A/B);</p> <p>24590-LAW-P6C-LOP-10016, Rev. E, Pipe Stress Analysis for LOP System (Design Calculation);</p> <p>24590-LAW-PHC-LVP-40001, Rev. 0, RPP-WTP Engineered Support Calculation for LAW-LVP-H30174, LAW-LVP-H30175, LAW-LVP-H30176, &amp; LAW-LVP-H30177, including ECCN # 00016 (Design Calculation);</p> <p>24590-CD-POA-MEE0-00003-05-00002, Rev. 00E, Seismic Analysis of Flanged Electric Heater (LVP-HTR-00001A/B &amp; -00003A/3B Housing Units Design Calculation).</p>	<p>The Technical Requirement listed in the MR and in MDS for HEPA Pre-heater Housings require that these MUs including all related components and appurtenances be designed and fabricated in accordance with the applicable sections of ASME and NFPA 70 codes and standards listed in the Source of Information column. These codes and standards require specific consideration of operating pressures, temperatures, corrosion allowance, and seismic loads in the design process. The Mechanical Data Sheet identifies the operating pressure and temperature ranges and seismic categories for the subject MUs. A corrosion allowance of 0.0425" is recommended for these MUs as identified in the Corrosion Evaluation document. The UBC 1997 Code specifies the seismic loads for the SC-III equipment. <b>The listed Design Calculation reviewed shows that the applicable loading parameters including the applicable design change notices such as DCNs, TCNs, and SDDRs were appropriately considered in the design process and the MU housings will have adequate strength to sustain them during their design life.</b></p>

**Table B-2-F-1. DFLAW Design Completion Fee**

DFLAW Design Completion Fee Milestones	Fee (\$)
<b>DFLAW Design Completion</b>	
<b>Interim Milestone Completion Incentive Fee –</b>	
<u>Description:</u>	
1) Complete the constructability review, model review and initial Hazard Analysis for the DFLAW Effluent Management Facility by-	
December 31, 2015	\$500,000
After March 31, 2016 and before June 30, 2016	\$250,000
After June 30, 2016	\$0
2) Prepare and issue the DFLAW EMF Safety Basis Change Package (SBCP)/Preliminary Documented Safety Analysis (PDSA) update as an addendum to the LAW PDSA by-	
July 31, 2016	\$500,000
After October 30, 2016 and before January 31, 2017	\$250,000
After January 31, 2017	\$0
<b>Cost Incentive Fee –</b>	
<u>Description:</u> DOE and the Contractor will share cost under runs on completion of CLIN 2.1 of less than target contract cost (\$75M) in the ratio of 80% DOE/20% Contractor, subject to the maximum combined fee limitation.	
DOE and the Contractor will share cost overruns on completion of CLIN 2.1 of more than target contract cost (\$75M) in the ratio of 80% DOE/20% Contractor, subject to the minimum fee limitation.	
<b>Schedule Incentive Fee –</b>	
<u>Description:</u> For every full month DFLAW Design Completion is accepted as complete per Section J Attachment Q, prior to April 30, 2018, fee will be increased by \$100,000 subject to the maximum combined fee limitation.	
In the event DFLAW Design Completion is accepted as complete between April 30, 2018 and July 31, 2018, fee will be reduced by \$100,000 for each full month completion occurs after April 30, 2018 per Section J Attachment Q.	
In the event DFLAW Design Completion is accepted as complete per Section J Attachment Q after July 31, 2018, total fee available will be reduced to the minimum fee of \$750,000.	
<b>Minimum Fee under DFLAW Design Completion (exclusive of any Interim Milestone Completion Fee)</b>	\$750,000
<b>Target Fee under DFLAW Design Completion (exclusive of any Interim Milestone Completion Fee)</b>	\$4,500,000
<b>Maximum Fee inclusive of Cost, Schedule &amp; Interim Milestone Completion Incentive Fee</b>	\$9,000,000

## C.7 FACILITY SPECIFICATION

The Facility Specification provides minimum functional requirements for the process and facility design and the waste treatment capacity requirements. Additional requirements are contained in Section C.6, *Standards*. DOE will consider changes to the Facility Specifications that improve life-cycle performance, cost, and schedule.

- (a) Functional Design Requirements: The WTP is comprised of five major facilities, Pretreatment (PT), LAW immobilization, HLW immobilization, Analytical Laboratory, and Balance of Plant Facilities (BOF). The WTP shall be designed to:
- (1) Have a forty (40)-year operating life for the operating facilities (PT, HLW, LAW), Analytical Laboratory, and BOF exclusive of ancillary facilities (i.e., warehouses, construction support facilities, and administrative offices).
  - (2) Separately receive and store LAW feed (defined in Specification 7, *Low-Activity Waste Envelopes Definition*) and HLW feed (defined in Specification 8, *High-Level Wastes Envelope Definition*) in appropriately designed vessels. The DOE will provide waste transfer lines to an interface point described in ICD 19. The DOE will also provide adequate pumping motive force to transfer the waste to the WTP Receipt Vessels.
  - (3) **For CLIN 2.1, LAW Vitrification shall be designed to receive treated LAW feed (Specification 7, Envelope E) from a Low Activity Waste Pretreatment System (LAWPS) provided by DOE.** The DOE will provide waste transfer lines to an interface point described in ICD 30. The DOE will also provide adequate pumping motive force to transfer the waste to the WTP Receipt Vessels. **(350)**
  - (4) Treat and immobilize the LAW feed (Specification 7, Envelope A, B, C and E) **(350)** and provide the final waste products described in Specification 2, *Immobilized Low-Activity Waste Product*, for return to DOE.
  - (5) Implement the sludge treatment process steps as proposed by the Contractor, and approved by DOE in accordance with Standard 2, (a), (3), (iii), for solids washing, caustic leaching, and oxidative leaching; immobilize the HLW feed and radionuclides separated from LAW feed, and provide the final waste products described in Specification 1, *Immobilized High Level Waste Product*, for return to DOE.
  - (6) Disposition all secondary wastes in accordance with ICD requirements; secondary wastes are identified in Section C.9, *Interface Control Documents* and Standard 6, *Product Qualification, Characterization and Certification*.
  - (7) The Pretreatment Facility shall have the capability to return to the Hanford Double-Shell Tank Farm process streams in accordance with Specification 9, *Liquids or Slurries*, transferred to DOE tanks by pipeline.
  - (8) Provide for safeguards and security of DOE owned materials, property, and information in accordance with Standard 8, *Safeguards and Security*.
  - (9) Include a Radiochemical Analytical Laboratory to support the operations of the facilities, including: process control, waste form qualification testing, environmental analyses, and limited technology testing. The capacity of the Analytical Laboratory shall be sufficiently sized and scoped to support the waste treatment capacity of the facilities. The technical basis to support the definition of the Analytical

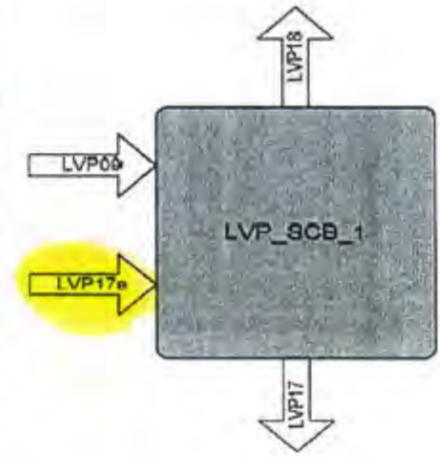
CORROSION EVALUATION

24590-WTP-RPT-PR-04-0001, Rev. 00A  
WTP Process Corrosion Data-Volume 4

Figure C-36 LVP-SCB-00001 Aqueous PCDS

Vessel : LVP\_SCB\_1

Properties	Stream ID			
	LVP09	LVP17a	LVP18	LVP17
Suspended Solids [wt %]	n/a	0	0	0
Total Salts [wt %]	n/a	0.62	0.00	0.63
Sodium Molarity [M]	n/a	0.11	n/a	0.11
Relative Humidity [%]	1.25	n/a	100.00	n/a
pH	n/a	11.43	n/a	9.50
Anti-Foam Agent [ppm]	0	0	0	0
TOC [kg/h]	1.46E-04	5.68E-03	2.40E-11	4.37E-02
Pressure [bar]	0.90	0.90	0.87	0.90
Temperature [C]	211.11	50.00	50.00	50.00
Temperature [F]	412.00	122.00	122.00	122.00
Water Flow Rate [kg/hr]	319.15	45,169.00	539.18	44,948.97
Total Aqueous Flow Rate [kg/hr]	319.15	45449.33	539.18	45229.30
Total Flow Rate [kg/hr]	6.20E+03	4.54E+04	6.42E+03	4.52E+04
UserNote	VIT VAPOR Caustic Scrubber Inlet	VIT LIQUID LAW Liquid to LVP-SCB-00001	VIT VAPOR Caustic Scrubber Offgas Discharge	VIT LIQUID Caustic Scrubber Scrubbing Solution Recirc.



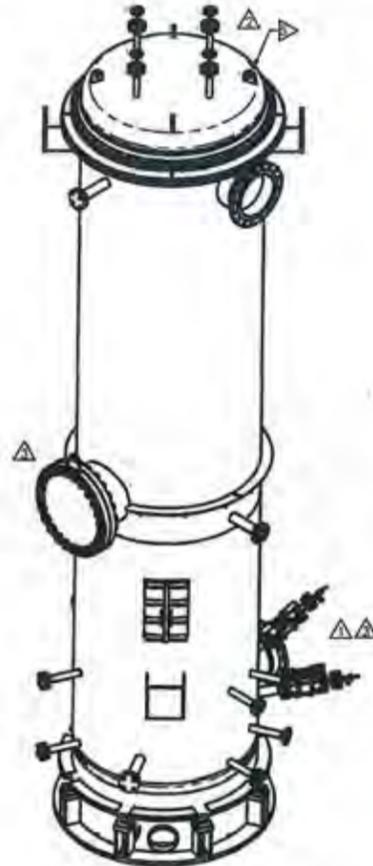
AQUEOUS				
Cations (ppm)				
Ag+	0	0	0	0
Al+3	0	0	0	0
Am+3	0	0	0	0
As+5	0	0	0	0
B+3	0	0	0	0
Ba+2	0	0	0	0
Be+2	0	0	0	0
Bi+3	0	0	0	0
Ca+2	0	0	0	0
Cd+2	0	0	0	0
Ce+4	0	0	0	0
Co+2	0	0	0	0
Cr+3	0	0	0	0
Cr+6	0	0	0	0
Cs+	0	0	0	0
Cu+2	0	0	0	0
Eu+3	0	0	0	0
Fe+2	0	0	0	0
Fe+3	0	0	0	0
H+	0	0	0	4
Hg+2	0	0	0	0
K+	0	0	0	0
La+3	0	0	0	0
Li+	0	0	0	0
Mg+2	0	0	0	0
Mn+4	0	0	0	0
Mo+6	0	0	0	0
Na+	0	2435	0	3994
Nd+3	0	0	0	0
Ni+2	0	0	0	0
Pb+2	0	0	0	0
Pd+2	0	0	0	0
Pr+4	0	0	0	0
Pu+4	0	0	0	0
Ra+2	0	0	0	0
Rb+	0	0	0	0
Rh+3	0	0	0	0
Ru+4	0	0	0	0
Sb+3	0	0	0	0
Se+4	0	0	0	0
Si+4	0	0	0	0
Sr+2	0	0	0	0
Ta+5	0	0	0	0
Tc+4	0	0	0	0
Te+4	0	0	0	0
Th+4	0	0	0	0
Tl+4	0	0	0	0
Tl+5	0	0	0	0
U+4	0	0	0	0
V+3	0	0	0	0
W+6	0	0	0	0
Y+3	0	0	0	0
Zn+2	0	0	0	0
Zr+4	0	0	0	0
Anions (ppm)				
B(OH)4-	0	0	0	0
C2O4-2	0	0	0	0
Cl-	0	49	0	51
CN-	0	0	0	0
CO3-2	0	3400	0	5518
F-	0	15	0	15
H2PO4-	0	0	0	0
H2SiO4-2	0	0	0	0
H3SiO4-	0	0	0	0
HCO3-	0	0	0	0
HPO4-2	0	0	0	0
HSO3-	0	0	0	0
HSO4-	0	0	0	0
I-	0	0	0	0
IO3-	0	0	0	0
NH4+	0	222	0	236
NO2-	0	0	0	0
NO3-	0	1	0	1
O-2	0	0	0	0
O2-2	0	0	0	0
OH(aq)-	0	46	0	78
OH(s)-	0	0	0	0
PO4-3	0	0	0	0
SO3-2	0	0	0	101
SO4-2	0	1	0	31
Organics (ppm)				
AFA_DCOMP	0	0	0	0
AFA_NVOC	0	0	0	0
NVOC	0	0	0	0
Sucrose	0	0	0	0
SVOC	0	0	0	0
VOC	0	0	0	1

And Does not  
Address  
DILAW  
Feed Spec  
"Envelope E"



NOTES:

- 1. ALL ITEMS WILL BE CONSIDERED IMPORTANT TO SAFETY (I.T.S) UNLESS MARKED AS COMMERCIAL GRADE (C.G.) IN BILL OF MATERIALS.
- 2. ALL MILL AND FABRICATION MARKS SHALL BE REMOVED, ALL EXPOSED SURFACES SHALL BE FREE OF SHARP EDGES, CRACKS, PITS, OXIDES, AND OTHER SURFACE IRREGULARITIES.
- 3. FOR INSTALLATION, SEE KOCH-GLITSCH DRAWING NUMBERS 987637-D000, 987637-D001, AND 987637-D003.
- 4. APPROXIMATE ASSEMBLY WEIGHT: 38178 LBS.
- 5. A REFERENCE LINE SHALL BE LIGHTLY VIBRO ETCHED ON THE OUTSIDE OF THE VESSEL SHELL AT THE TANGENT LINE OF THE HEADS.



ISOMETRIC VIEW  
OFFGAS CAUSTIC SCRUBBER ASSEMBLY

ITEM NO.	QTY	REF. DWG.	NAME	MATERIAL/DESCRIPTION	MATL SPEC.	WEIGHT	C.G.
1	1	C2609-M-200-1	VESSEL WELDMENT			24725	NA
2	1	C2609-M-110-1	FILTER FRAME ASSEMBLY			7426	NA
3	1	C2609-M-250-1	TOP HEAD WELDMENT			1993	NA
5	1	C2609-M-215-4	N04 SPRAY RING WELDMENT			76	NA
7	1	C2609-M-260-1	N08 MANWAY COVER WELDMENT			753	NA
8	4	C2609-M-215-14	NS1A, NS2A, NS3A, & NS4A WELDMENT			18	NA
9	1		SUPPORT GRID ASSEMBLY	HIGH KOCH-GLITSCH MODEL 802		300	X
10	5		STRUCTURED PACKING	HIGH KOCH-GLITSCH FLEXPAC 2Y		352	X
11	1		HOLD DOWN GRID ASSEMBLY	HIGH KOCH-GLITSCH MODEL 803		227	X
18	1		TOP HEAD GASKET	1/8" THK X 68" ID X 72" OD	THERMICULITE B15	15.6	X
19	1		GASKET	24" CL300 RF SPIRAL-WOUND ASME B16.20 WITH GRAPHITE FILLER	TYPE 316 (MAX 0.030% C, DUAL CERT.)	10.9	X
20	1		GASKET	3" CL150 RF SPIRAL-WOUND ASME B16.20 WITH GRAPHITE FILLER	TYPE 316 (MAX 0.030% C, DUAL CERT.)	0.3	X
21	1		GASKET	3" CL150 RF SPIRAL-WOUND ASME B16.20 WITH GRAPHITE FILLER	UNS N10276	0.04	X
22	1		GASKET	3" CL150 RF SPIRAL WOUND ASME B16.20 WITH GRAPHITE FILLER	TYPE 316 (MAX 0.030% C, DUAL CERT.)	1.2	X
23	8		GASKET	3" CL150 RF SPIRAL WOUND, ASME B16.20 WITH GRAPHITE FILLER	UNS N10276	1.3	X
24	2		GASKET	2" CL 150# RF SPIRAL WOUND ASME B16.20 WITH GRAPHITE FILLER	UNS N10276	0.8	X
25	4		GASKET	1 1/2" CL300 RF SPIRAL-WOUND ASME B16.20 WITH GRAPHITE FILLER	TYPE 316 (MAX 0.030% C, DUAL CERT.)	0.2	X
28	1		BLIND FLANGE	3" 150# RF BLIND FLANGE	ASME SA-182 F 316 (MAX 0.030% C, DUAL CERT.)	11.0	X
29	1		BLIND FLANGE	3" 150# RF BLIND FLANGE	ASME SA-182 F 316 (MAX 0.030% C, DUAL CERT.)	12.4	X
30	2		BLIND FLANGE	2" 150# RF BLIND FLANGE	ASME SA-182 F 316 (MAX 0.030% C, DUAL CERT.)	6.0	X
31	4		FLAT WASHER	FW 1/2"	ASME SA-240 316	0.010	X
32	2		HEX BOLT	1/2"-13 UNC X 2" LG	ASME SA-193 GR 88M	0.2	X
33	2		HEX NUT	1/2"-13 UNC	ASME SA-194 GR 8M	0.04	X
38	8		FLAT WASHER	FW 5/8"	ASME SA-240 316	0.03	X
39	4		HEX BOLT	5/8"-11 UNC X 3" LG	ASME SA-193 GR 88M	0.4	X
40	4		HEX NUT	5/8"-11 UNC	ASME SA-194 GR 8M	0.08	X
41	96		FLAT WASHER	FW 5/8"	ASME SA-240 316	0.026	X
42	32		HEX BOLT	5/8"-11 UNC X 3" LG	ASME SA-193 GR 87	0.4	X
43	16		HEX BOLT	5/8"-11 UNC X 3 1/2" LG	ASME SA-193 GR 87	0.4	X
44	16		HEX NUT	5/8"-11 UNC	ASME SA-194 GR 2H	0.08	X
45	144		FLAT WASHER	FW 3/4"	ASME SA-240 316	0.04	X
46	56		HEX BOLT	3/4"-10 UNC X 4" LG	ASME SA-193 GR 87	0.7	X
47	16		HEX BOLT	3/4"-10 UNC X 3" LG	ASME SA-193 GR 87	0.5	X
48	72		HEX NUT	3/4"-10 UNC	ASME SA-194 GR 2H	0.14	X
49	48		FLAT WASHER	FW 1 1/2"	ASME SA-240 316	0.05	X
50	24		HEX BOLT	1 1/2"-8 UNC X 7 1/2" LG	ASME SA-193 GR 87	3.0	X
51	24		HEX NUT	1 1/2"-8 UNC	ASME SA-194 GR 2H	1.08	X
52	4	C2609-M-250-1	N07 FLOMAX LANCE ASSEMBLY			36	X
53	4		3" FULL PORT BALL VALVE	ENL REF DWG #18V-P2-50-0045		89	X

NOZZLE	SIZE (IN)	WALL/SCH	FACING	FLANGE RATING	SERVICE / REMARKS
N01	18	5/8	RF-WN	150#	OFFGAS INLET
N02	18	5/8	RF-WN	150#	OFFGAS OUTLET
N03	8	1/2	RF-WN	150#	CAUSTIC SOLUTION RETURN TO COLLECTION TANK / SCRUBBER DRAIN (CONDENSATE DISCHARGE)
N04	3	1/2	RF-WN	150#	CAUSTIC SOLUTION SUPPLY (CONDENSATE RECIRCULATION)
N06	2	.344	RF-WN	150#	PACKING BOTTOM WASH
N07A	3	1/2	RF-WN	150#	REPLACEABLE QUENCHING OFFGAS SPRAY NOZZLE
N07B	3	1/2	RF-WN	150#	REPLACEABLE QUENCHING OFFGAS SPRAY NOZZLE
N07C	3	1/2	RF-WN	150#	REPLACEABLE QUENCHING OFFGAS SPRAY NOZZLE
N07D	3	1/2	RF-WN	150#	REPLACEABLE QUENCHING OFFGAS SPRAY NOZZLE
N08	24	1/2	RF-WN	300#	MANWAY
N10	2	.344	RF-WN	150#	PRESSURE DIFFERENTIAL TRANSMITTER ACROSS PACKING & DEMISTER
N11	2	.344	RF-WN	150#	PRESSURE DIFFERENTIAL TRANSMITTER ACROSS PACKING & DEMISTER
N12	2	.344	RF-WN	150#	OFFGAS OUTLET CONDENSATE RETURN TO SCRUBBER
N13	2	.344	RF-WN	150#	SPARE (FUTURE) LEVEL TRANSMITTER WITH BLIND FLANGE, GASKETS, AND BOLTS
N14	2	.344	RF-WN	150#	LEVEL TRANSMITTER
N15	2	.344	RF-WN	150#	SPARE (FUTURE) LEVEL TRANSMITTER WITH BLIND FLANGE, GASKETS, AND BOLTS
N16	2	.344	RF-WN	150#	LEVEL TRANSMITTER
N17	2	.344	RF-WN	150#	PRESSURE DIFFERENTIAL TRANSMITTER FOR PACKING
N18	2	.344	RF-WN	150#	PRESSURE DIFFERENTIAL TRANSMITTER FOR PACKING
N19	3	1/2	RF-WN	150#	SPARE WITH BLIND FLANGE, GASKETS AND BOLTS
N20	3	1/2	RF-WN	150#	SPARE WITH BLIND FLANGE, GASKETS AND BOLTS
NS1	1 1/2	.281	RF-WN	300#	DEMISTER WASH NOZZLE AT VESSEL INTERFACE
NS2	1 1/2	.281	RF-WN	300#	DEMISTER WASH NOZZLE AT VESSEL INTERFACE
NS3	1 1/2	.281	RF-WN	300#	DEMISTER WASH NOZZLE AT VESSEL INTERFACE
NS4	1 1/2	.281	RF-WN	300#	DEMISTER WASH NOZZLE AT VESSEL INTERFACE
NS1A	3/4	.218	RF-WN	300#	DEMISTER WASH NOZZLE SPRAY LANCES AT PROCESS SERVICE WATER INTERFACE
NS2A	3/4	.218	RF-WN	300#	DEMISTER WASH NOZZLE SPRAY LANCES AT PROCESS SERVICE WATER INTERFACE
NS3A	3/4	.218	RF-WN	300#	DEMISTER WASH NOZZLE SPRAY LANCES AT PROCESS SERVICE WATER INTERFACE
NS4A	3/4	.218	RF-WN	300#	DEMISTER WASH NOZZLE SPRAY LANCES AT PROCESS SERVICE WATER INTERFACE

No Corrosion Allowance for Internal Packing Support.

Please note that source, special material, and hydraulic materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated by the U. S. Department of Energy (DOE) under the authority of DOE orders pursuant to its Atomic Energy Act (AEA) license. The licensee, as defined in the AEA, is the sole responsibility and authority for the design, fabrication, and use of materials at DOE-owned nuclear facilities. Information contained herein on radioactivity is provided for reference purposes only.

**DESIGN DATA**

1. DESIGN FOR ASME CODE SECTION VIII DIVISION 2, UNDESIGNED AND UNSTAYED	YES
2. DESIGN PRESSURE	15.0 PSIG
3. DESIGN TEMPERATURE	150 F
4. WIND DESIGN METAL TEMP	150 F
5. OPERATING PRESSURE	15.0 PSIG
6. OPERATING TEMPERATURE	150 F
7. MAINT CODE	150 F
8. M.A.A.W.P. NEW	15.0 PSIG
9. MAX TEST PRESS	15.0 PSIG
10. CODE BOOK, PART NO. & CODE	ASME B31.3
11. CODE BOOK, PART NO. & CODE	ASME B31.3
12. CODE BOOK, PART NO. & CODE	ASME B31.3
13. HOLDING PRESSURE	15.0 PSIG
14. HYDROSTATIC TEST PRESS	15.0 PSIG
15. HYDROSTATIC TEST TEMPERATURE	150 F
16. PORT WELD BEHavior	150 F
17. WELDING PROCEDURE	ASME B31.3

ZONE	REV.	BY	P.J.M.	QA	PRO	ENG	OTHER	DATE	REVISION
ALL	3	JFT	KK	SA	SE	RCH		6/3/2015	REVISED PER DCN #15-046
ALL	2	JFT	NS	JC	DH	RCH		3/12/2015	REVISED PER DCN #14-059, 15-010, & 15-019
ALL	1	JFT	DM	JC	JM	RCH		7/3/2014	REVISED PER DCN #14-010, 14-028, 14-038
ALL	0	JFT	DM	JC	JM	RCH		1/6/2014	REVISED PER DCN #13-0108
0		BOC						11/4/2013	ISSUED FOR FABRICATION

**APPROVALS**

DATE	DATE
11/5/13	11/5/13
11/5/13	11/5/13
11/5/13	11/5/13

**PREMIER Technology, Inc.**  
1858 W. Bridge  
Blackfoot, Idaho 83221  
phone: (208) 785-2274

**LAW MELTER OFFGAS CAUSTIC SCRUBBER**  
24590-LAW-MK-LVP-SCB-00001  
BECHTEL JOB NO. 24590  
PTI SHOP NO. C2609-NQA1  
VESSEL ASSEMBLY

**DESIGN DATA**  
SCALE: N.T.S.  
TOTAL SHEETS: 4

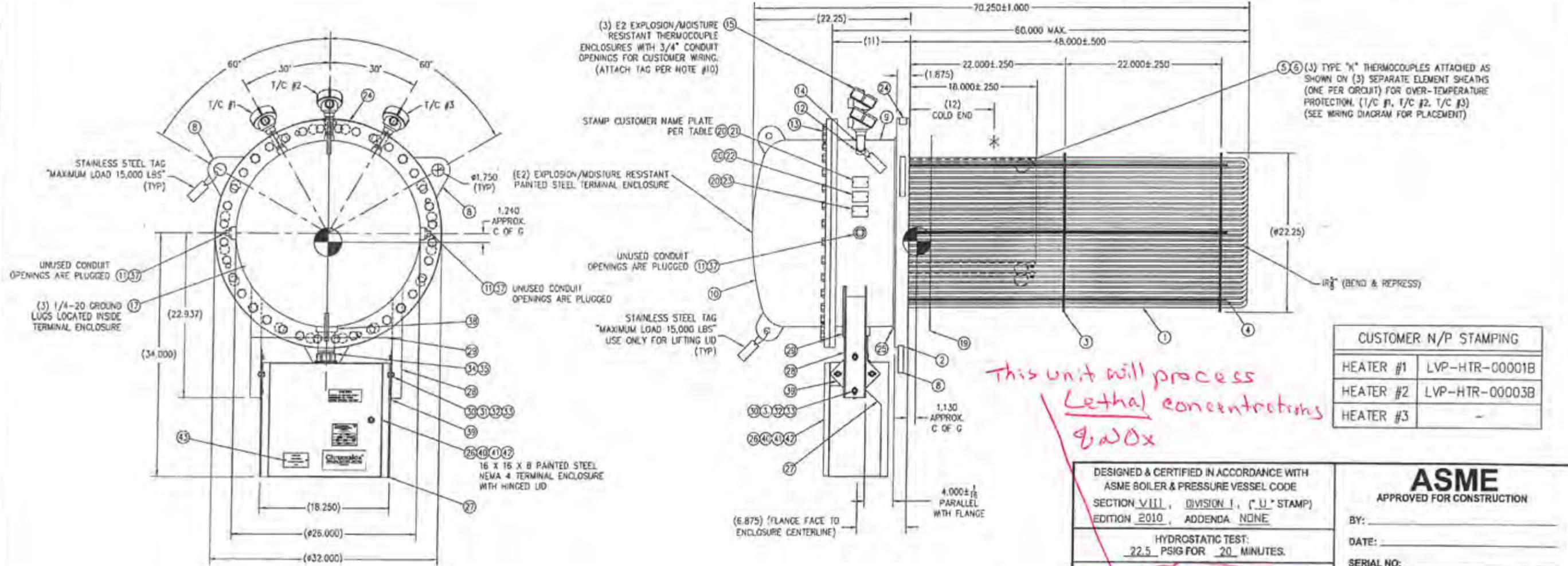
ORIGINAL  
JUN 12 2015

BECHTEL NATIONAL  
 PROJECT: RPP-WTP  
 PROJECT NO.: 24590  
 PO NO.: 24590-CO-POA-MEEO-00003, REV. 0  
 EQUIPMENT NO.: LVP-HTR-00001B, LVP-HTR-00003B  
 LOCATION: RICHLAND, WA

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radioactivity is provided for process description purposes only.

PRELIMINARY DRAWING  
**NOT FOR PRODUCTION USE**  
 EXCEPT FOR INFORMATION

ZONE	REV	DESCRIPTION	DATE	DMN	CHKD	EMCR	APVD
ALL	1	ADDED BILL OF MATERIALS, REMOVED STAND-OFF, CHANGED T/E LOCATION, REVISED WIRING DIAGRAM, CHANGED SPACER, MISC. CHANGES, EC #25582	2/8/2012	MCR	ROP	MCR	COJ
ALL	2	ADDED (1) LIFTING LUG FOR A TOTAL OF (3). EXTERNAL PRESSURE WAS 15 PSIG, ADDED FLANGE CORROSION ALLOWANCE NOTE #9, HEATING ELEMENT TUBING WALL THICKNESS WAS .028, C OF G WAS 22.5, HEIGHT WAS 1050 LBS, ADDED T/C TAGS, EC #29106	4/11/2012	MCR	ROP	MCR	COJ
ALL	3	ADDED EXTERNAL TERMINAL ENCLOSURE, ADDED SHEET #1, HEATER HEIGHT (NOTE #7) WAS 1056 LB, REVISED C OF G, EC #32197	8/19/2013	MCR	ROP	MCR	COJ
ALL	4	ADDED TERMINAL BLOCK, GROUND LUG, PANEL, NAMEPLATE, & ADJUSTMENT PLATE TO BOOM, EC #32420	7/24/2013	MCR	ROP	MCR	COJ
ALL	5	CORRECTED P/N FOR ITEM 31, QUANTITY FOR ITEMS 30, 31, 32, & 33 WAS (8), EC #32592	8/22/2013	MCR	ROP	MCR	COJ
ALL	6	CORRECTED P/N FOR ITEM 37, WAS 3/4" NPT, EC #32592	8/22/2013	MCR	ROP	MCR	COJ
ALL	7	ADDED EXTERNAL TERMINAL ENCLOSURE DETAIL, EC #32704	8/28/2013	MCR	ROP	MCR	COJ
ALL	8	NAMEPLATE INKS FOR HAZARDOUS LOCATIONS, EC #33299	12/18/2013	MCR	ROP	MCR	COJ
ALL	9	ADDED SST TAGS ON LIFTING LUGS, EC #33581	2/10/2014	MCR	ROP	MCR	COJ
ALL	10	CHANGED SPACER ROOFS FROM 304 SST TO 316 SST FOR CUSTOMER REQUEST, EC #35720	4/17/2015	MCR	ROP	MCR	COJ



CUSTOMER N/P STAMPING	
HEATER #1	LVP-HTR-00001B
HEATER #2	LVP-HTR-00003B
HEATER #3	-

DESIGNED & CERTIFIED IN ACCORDANCE WITH ASME BOILER & PRESSURE VESSEL CODE SECTION VIII, DIVISION 1, ("U" STAMP) EDITION 2010, ADDENDA NONE

HYDROSTATIC TEST: 22.5 PSIG FOR 20 MINUTES.

**DESIGN DATA**

HEATED MEDIUM: AIR  
 LETHAL SUBSTANCE: YES  NO   
 DESIGN PRESSURE: 15 PSIG (MAWP)  
 EXTERNAL MAWP: FV PSIG  
 PROCESS DESIGN TEMP.: 250 °F  
 MIN. TEMP. (MDMT): -20 °F

**ASME**  
 APPROVED FOR CONSTRUCTION

BY: \_\_\_\_\_  
 DATE: \_\_\_\_\_  
 SERIAL NO: \_\_\_\_\_

USER DATA APPROVAL DATE: \_\_\_\_\_

MIN. FLOW RATE: 1130 CFM  
 MAX. FLOW RATE: \_\_\_\_\_

OPERATING PRESSURE: 15 PSIG  
 OPERATING TEMPERATURE: 182 °F

SEE SHEET #3 FOR BILL OF MATERIALS

PART	MAX. ALLOWABLE WORKING PRESS.	15	PSIG	250	Y	MFC S/N	
	MAX. ALLOWABLE EXTERNAL WORKING PRESS.	FV	PSIG	250	Y	YR. BUILT	2013
	MINIMUM DESIGN METAL TEMP.	-20	T	MAWP	15	PSIG	
	24 ASME NAMEPLATE DETAIL						

<b>Chromalox</b> PRECISION HEAT AND CONTROL	
CAT. NO. TMIS-72-039P-E2XX	
P/N 155-073232-082	
480 V 3 PH 39 KW	
DATE: 02-13-2012	DATE: 02-13-2012
SCALE: 1/8" = 1'-0"	SCALE: 1/8" = 1'-0"

23 CHROMALOX NAMEPLATE DETAIL

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES AND FINISHES AND FRACCTIONS: DECIMALS: 1/16, 1/32, 1/64, 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, 1.0. ANGLES: 25, 30, 45, 60, 90, 120, 150, 180. SURF. FINISH: UNLESS OTHERWISE SPECIFIED, ALL SURFACES TO BE FINISHED TO A 32-RMS FINISH.	CONTRACT NO	<b>Chromalox</b> Ogden, Utah 84404 www.chromalox.com
MATERIALS	USED ON	IMMERSION HEATER FLANGED
APPROVALS	DATE	TMIS-72-039P-E2XX, 480V, 39KW, 3-3PH, 5.0 WPSI
DMN MCR 1/13/2012		24"-150# CONST., ALVAC AL6XN*ASME*
CHKD RDP 1/13/2012		SIZE CODE IDENT NO DRAWING NO
ENGR MCR 1/13/2012		D 07131 155-073232-082 10
APVD COJ 1/13/2012		SCALE 1"=7'
DMO COJ 2042941		DO NOT SCALE DRAWING SHEET 1 OF 3
CAD NO		



**From:** Judy Pigott [mailto:judster7@comcast.net]  
**Sent:** Wednesday, December 30, 2015 9:37 PM  
**To:** Hanford (ECY) <hanford@ECY.WA.GOV>  
**Cc:** Tom Carpenter <tomc@hanfordchallenge.org>  
**Subject:** comments

Dieter - I have been following the work at Hanford, and have comments regarding two recent mailings:

1. *Ecology Proposes Changes to Waste Treatment Plant Design:* These sound well-directed, AS LONG AS they don't change the schedule/time line of the proposed clean up. If they did extend the clean up, then I'd think they, though sounding good, were a delay tactic.
2. *Changes to Part II Permit Conditions and Attachment 9 of the Hanford Site-wide Permit:* The difficulties here were known before. This seems intended to add another delay. Instead of doing as proposed, add resources to the current plan and move forward!

Thank you for giving me the opportunity to give “voice” to my perspectives — Judy

1718 Palm Ave SW  
Seattle, WA 98116  
206-933-6577 (h)  
206-948-0125 (cell)

[2015: Awareness of Abundance](#)