Air Quality Improvement Program (AQIP)
Advanced Technology Demonstration Project

Grant ~~Summary and Authorization Form~~ Agreement
Fiscal Year 2009-10

California Air Resources Board
~~February 14, 2011~~
May 2, 2012

Amendment No. 2

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Grant Summary and Authorization Form, Amendment No. 2
Air Quality Improvement Program (AQIP) (Pursuant to AB 118)
Advanced Technology Demonstration Project

Fiscal Year 2009-10

Project Title: Tier 4 PM Retrofit System for a Genset Switch Locomotive

Grant Number: G09-AQIP-13

Grant Amount: $346,178
Match Amount: $346,178

Grant Recipient Name: City of Los Angeles Harbor Department

Authorized Official: ~~Christopher Patton~~ Geraldine Knatz, Ph.D.

Title: ~~Acting Assistant Director of Environmental Management~~
Executive Director

Address: 425 South Palos Verdes Street
San Pedro, CA 90731

Phone #: (310) 732-3947

Tax ID No: 95-6000735W

Amendment No. 2 for Grant Number G09-AQIP-13 revises Exhibit A (provisions 1.2, 1.4, 1.5, 2.2, 2.3, 3.3, and 3.7) and Exhibit B (provisions Attachment II-III). Deletions to the Grant Agreement are shown below with ~~strikeout~~ text and additions are shown with underline text. All other terms and conditions remain the same.

The following documents are attached and incorporated as part of this grant and take precedence in the following order:

Exhibit A: Grant Provisions
Exhibit B: Work Statement incorporating the following attachments:
Budget Summary (Attachment I)
Disbursement Schedule (Attachment II)
Project Implementation Schedule (Attachment III)
Key Project Personnel (Attachment IV)
Exhibit C: Grant Disbursement Request Form
Exhibit D: Advanced Technology Demonstration Project: Advanced Locomotive Aftertreatment Technologies Fiscal Year 2009-10 Grant Proposal Solicitation and Grantee Application Package
Exhibit E: Tier 4 PM Retrofit System for a Genset Switch Locomotive Application

The undersigned parties agree to comply with the requirements and conditions contained herein, including all provisions, roles, and responsibilities identified in the Advanced Technology Demonstration Project: Advanced Locomotive Aftertreatment Technologies Fiscal Year 2009-10 Grant Proposal Solicitation as well as all commitments identified in the Grantee Application Package. The undersigned parties certify under the penalty of perjury that they are duly authorized to bind the parties to this grant.

California Air Resources Board:

Signature of Authorized Official

Name: Cathy Chapin
Title: Chief, Financial Operations Branch
Date: 5/2/12

Grant Recipient:

Signature of Authorized Official

Name: ~~**Christopher Patton**~~ **Geraldine Knatz, Ph.D.**
Title: ~~**Acting Assistant Director of Environmental Management**~~ **Executive Director**
Date:

APPROVED AS TO FORM AND LEGALITY
5-10 12
CARMEN A. TRUTANICH, City Attorney
By _____
City Attorney

EXHIBIT A

Grant Provisions

1. GRANT PARTIES AND CONTACT INFORMATION

1.1 This grant is from the California Air Resources Board (herein after referred to as ARB) to City of Los Angeles Harbor Department (herein after referred to as Grantee).

1.2 The ARB Grant ~~Administrator~~ Coordinator is ~~Zina Malchenko~~ Michelle Fojas. All financial inquiries regarding this project shall be directed to:

~~Zina Malchenko~~ Michelle Fojas
Air Resources Board
Administrative Services Division
P.O. Box 1436
Sacramento, California 95812
Phone: (916) ~~324-9907~~ 322-8204
E-mail: ~~zmalchen@arb.ca.gov~~ mfojas@arb.ca.gov

1.3 The ARB Project Liaison is Earl Landberg. Correspondence regarding this project shall be directed to:

Earl Landberg
Air Resources Board
Mobile Source Control Division
P.O. Box 2815
Sacramento, California 95812
Phone: (916) 323-1384
E-mail: elandber@arb.ca.gov

1.4 The Grantee Liaison is Tunisia Hardy. Correspondence regarding this project shall be directed to:

Tunisia Hardy
Project Coordinator for the Port of Los Angeles
425 S. Palos Verdes Street
San Pedro, CA 90731
Phone: (310) 732-3615
Email: thardy@portla.org

~~1.4~~ 1.5 This grant is not assignable by the Grantee, either in whole or in part, without the consent of ARB.

2. TIME PERIOD

2.1 Performance of work or other expenses billable to ARB under this grant may commence after signing and awarding of this grant. Performance on this grant ends once the Grantee has received their last reimbursement of administrative funds or if the grant is terminated, whichever is earlier.

2.2 All work must be completed ~~within two years of grant execution~~ by June 1, 2013.

2.3 All funds must be disbursed to the Grantee no later than June ~~30, 2012~~ 1, 2013.

2.4 The ARB Executive Officer retains the authority to terminate or reduce the dollar amount of this grant if by January 1, 2012, 60 percent of project funding has not been expended by the Grantee. In the event of such termination, Section 6 of these provisions shall apply.

3. FINANCIAL MATTERS

3.1 ARB's obligations under this Grant Agreement are contingent upon the availability of funds. In the event funds are not available, the State shall have no liability to pay any funds whatsoever to the Grantee or to furnish any other considerations under this Grant Agreement.

3.2 The Grantee agrees that, at a minimum, its fiscal control and accounting procedures will be sufficient to permit tracing of grant funds to a level of expenditure adequate to establish that such funds have not been used in violation of State law or this Grant Agreement. Unless otherwise prohibited by State or local law, the Grantee further agrees that it will maintain separate Project accounts in accordance with generally accepted accounting principles.

Budget

3.3 The maximum amount of this grant is $346,178. Under no circumstance will ARB reimburse the Grantee for more than this amount. A written Grant Agreement amendment is required whenever there is a change to the amount of this grant.

3.4 The budget for this project is shown in Exhibit B, Attachment I. Except as stated in Section 3.5 of these provisions, grant disbursements for demonstration technology and administrative funds shall not exceed the corresponding AQIP grant amount.

3.5 The total AQIP funding may only be reallocated in the event that the Grantee

requests less administrative funding than the amount stated in the budget.

3.6 No grant funds may be used to purchase equipment or computers that would be required to be returned to the State at the completion of this demonstration project.

Grant Disbursements

3.7 Requests for payment shall be made with the ~~grant disbursement request~~ Grant Disbursement Request Form (Exhibit C) and conform to the instructions identified in the Advanced Technology Demonstration Project: Advanced Locomotive Aftertreatment Technologies Fiscal Year 2009-10 Grant Proposal Solicitation. Grant payments shall be made only for reasonable costs incurred by the Grantee and only when the Grantee has submitted a grant disbursement request, milestones stipulated in Exhibit B, Attachment II have been accomplished, documentation of accomplishment has been provided to ARB in the form of the Status Report, and any associated deliverables, if applicable, have been provided to ARB.

3.8 Grant payments are subject to ARB's approval of Status Reports and any accompanying deliverables. (See Section 5 of these provisions.) A payment will not be made if the ARB Project Liaison deems that a milestone has not been accomplished or documented, that a deliverable meeting specifications has not been provided, that claimed expenses are not documented, not valid per the budget, or not reasonable, that the Grantee has not met other terms of the grant.

The Chief of the Mobile Source Control Division or designee of ARB may review the ARB Project Liaison's approval or disapproval of a grant disbursement. No reimbursement will be made for expenses that, in the judgment of the Division Chief of the Mobile Source Control Division, are not reasonable or do not comply with the grant agreement.

3.9 The Grantee will mail grant disbursement requests to the ARB Project Liaison.

3.10 The ARB will withhold payment of ten percent of funds until completion of all work and submission to ARB by Grantee of a final report. It is the Grantee's responsibility to submit a grant disbursement request for this final disbursement of funds.

Oversight and Accountability

3.11 The Grantee is responsible for all oversight of the Technology Demonstrator(s) and any subcontractors.

3.12 The ARB or its designee reserves the right to audit at any time during the

duration of this grant the Grantee's costs of performing the grant and to refuse payment of any reimbursable costs or expenses that in the opinion of the ARB or its designee are unsubstantiated or unverified. The Grantee shall cooperate with the ARB or its designee including, but not limited to, promptly providing all information and documents requested, such as all financial records, documents, and other information pertaining to reimbursable costs, and any matching costs and expenses.

3.13 The Grantee shall retain all financial records referred to above and provide them for examination and audit by the State for three years after final payment under this grant.

3.14 ARB or its designee may recoup AQIP funds which were received based upon misinformation or fraud, or for which a Grantee, manufacturer, or technology provider is in significant or continual non-compliance with the terms of this grant or State law. ARB also reserves the right to prohibit any entity from participating in the Advanced Technology Demonstration Project due to non-compliance with project requirements.

4. PROJECT MONITORING

Meetings

4.1 Initial meeting: A meeting will be held between key project personnel and ARB staff before work on the project begins. The purpose of the first meeting will be to discuss the overall plan, details of performing the tasks, the project schedule, and any issues that may need to be resolved.

Review meetings: Meetings to discuss progress must be held at least quarterly beginning three months after the initial meeting. Additional meetings may be scheduled at the sole discretion of the ARB Project Liaison. Such meetings may be conducted by phone, if deemed appropriate by the ARB Project Liaison.

Final Meeting: A final meeting will be held at the conclusion of the project to review project results and plans for technology commercialization. This meeting must be held prior to the distribution of the last payment of administrative funds. This meeting may be conducted by phone if deemed appropriate by the ARB Project Liaison.

Technical Monitoring

4.2 Any changes in the scope or schedule for the project shall require the prior written approval of the ARB Project Liaison.

4.3 The Grantee shall notify the ARB Project Liaison and Grant Administrator, in writing, immediately if any circumstances arise (technical, economic, or otherwise), which might place completion of the project in jeopardy. The Grantee shall also make such notification if there is a change in key project personnel (see Exhibit B, Attachment IV).

4.4 In addition to Status Reports (discussed in Section 5 of these provisions), the Grantee shall provide information requested by the ARB Project Liaison that is needed to assess progress in completing tasks and meeting the objectives of the project.

4.5 Any change in budget allocations, re-definition of deliverables, or extension of the project schedule must be requested in writing to the ARB Project Liaison and approved by ARB, in its sole discretion.

5. REPORTING

Status Reports

5.1 The Grantee shall submit Status Reports at a minimum of three-month intervals. The Status Reports shall be provided in a format agreed upon between the ARB Project Liaison and the Grantee and meet the requirements of the Advanced Technology Demonstration Project: Advanced Locomotive Aftertreatment Technologies Fiscal Year 2009-10 Grant Proposal Solicitation.

5.2 Every grant disbursement request (Exhibit C) shall be accompanied by a Status Report that documents the completion of a milestone specified in Exhibit B, Attachment II.

5.3 If the project is behind schedule, the Status Reports must contain an explanation of reasons and how the Grantee plans to resume the schedule.

Final Report

5.4 When the project is complete, the Grantee shall submit a draft Final Report. The draft Final Report must be submitted to ARB in an appropriate format agreed upon between the ARB Project Liaison and the Grantee. The Final Report must meet the requirements of the Advanced Technology Demonstration Project: Advanced Locomotive Aftertreatment Technologies Fiscal Year 2009-10 Grant Proposal Solicitation. Upon approval of the draft Final Report by the Project Liaison, the Grantee shall provide a written copy of the final version, plus an electronic file.

6. TERMINATION AND SUSPENSION OF PAYMENTS

6.1 The ARB reserves the right to terminate this grant upon thirty days' written notice to the Grantee, if the ARB determines that the project has not progressed satisfactorily during the previous three months and the Grantee and ARB have been unable to agree on modifications. In case of early termination, the Grantee will submit a grant disbursement request, a Status Report covering activities up to, and including, the termination date and following the requirements in Sections 3 and 5 of these provisions. Upon receipt of the grant disbursement request and Status Report a final payment will be made to the Grantee. This payment shall be for all ARB-approved, actually incurred costs that in the opinion of ARB are justified. However, the total amount paid shall not exceed the total grant amount.

6.2 The ARB reserves the right to issue a grant suspension order in the event that a dispute should arise. The grant suspension order will be in effect until the dispute has been resolved or the grant has been terminated. If the Grantee chooses to continue work on the project after receiving a grant suspension order, the Grantee will not be reimbursed for any expenditure incurred during the suspension in the event ARB terminates the grant. If ARB rescinds the suspension order and does not terminate the grant, ARB will reimburse the Grantee for any expenses incurred during the suspension that are reimbursable in accordance with the terms of the grant.

7. CONTINGENCY PROVISION

7.1 In the event this grant is terminated for whatever reason, the ARB Executive Officer or designee reserves the right in his or her sole discretion to award a grant to the next highest scored applicant and if an agreement cannot be reached, to the next applicant(s) until an agreement is reached. If ARB is unable to award a grant under these circumstances, ARB may award a grant to other AQIP projects.

8. DISPUTES

8.1 The Grantee shall continue with the responsibilities under this Grant Agreement during any dispute. Grantee staff or management may work in good faith with ARB staff or management to resolve any disagreements or conflicts arising from implementation of this Grant Agreement. However, any disagreements that cannot be resolved at the management level within 30 days of when the issue is first raised with ARB staff shall be subject to resolution by the ARB Executive Officer, or his designated representative, whose decision shall be final and binding.

9. GENERAL PROVISIONS

9.1 No amendment or variation of the terms of this Grant Agreement shall be valid unless made in writing, signed by the parties and approved as required. No oral understanding or agreement not incorporated in the Grant Agreement is binding on any of the parties.

9.2 The Grantee agrees to indemnify, defend and hold harmless the State and the Board and its officers, employees, agents, representatives, and successors-in-interest against any and all liability, loss, and expense, including reasonable attorneys' fees, from any and all claims for injury or damages arising out of the performance by the Grantee, and out of the operation of the Advanced Technology Demonstration Project that is the subject of the Grant Agreement.

9.3 If a court of competent jurisdiction holds any provision of this Grant Agreement to be illegal, unenforceable or invalid in whole or in part for any reason, the validity and enforceability of the remaining provisions, or portions of those provisions, will not be affected.

9.4 Any waiver of rights with respect to a default or other matter arising under the Grant Agreement at any time by either party shall not be considered a waiver of rights with respect to any other default or matter. Any rights and remedies of the State provided for in this Grant Agreement are in addition to any other rights and remedies provided by law.

9.5 The parties to this Grant Agreement do not create rights in, or grant remedies to, any third party as a beneficiary of this Grant Agreement, or of any duty, covenant, obligation or undertaking established herein.

9.6 The Grantee, and its agents and employees, if any, in the performance of this Grant Agreement, shall act in an independent capacity and not as officers, employees or agents of ARB.

9.7 This Grant Agreement is governed by and shall be interpreted in accordance with the laws of the State of California. ARB and the Grantee hereby agree that any action arising out of this Grant Agreement shall be filed and maintained in the Superior Court in and for the County of Sacramento, California, or in the United States District Court in and for the Eastern District of California. The Grantee hereby waives any existing sovereign immunity for the purposes of this Grant Agreement.

9.8 The Grantee certifies that it is in compliance with applicable State and/or federal conflict of interest laws.

9.9 The Grantee certifies that it has appropriate systems and controls in place to ensure that State funds will not be used in the performance of this Grant Agreement for the acquisition, operation or maintenance of computer software in violation of copyright laws.

9.10 The Grantee agrees that it will, at all times, comply with and require its contractors and subcontractors to comply with all applicable federal and State laws, rules, guidelines, regulations, and requirements.

9.11 Neither ARB nor the Grantee shall be liable for or deemed to be in default for any delay or failure in performance under this Grant Agreement or interruption of services resulting, directly or indirectly, from acts of God, enemy or hostile governmental action, civil commotion, strikes, lockouts, labor disputes, fire or other casualty, etc.

9.12 The Grantee shall be responsible for work and for persons or entities engaged in work, including, but not limited to, employees, contractors, subcontractors, suppliers, and providers of services. The Grantee shall be responsible for any and all disputes arising out of its contracts for work on the Project, including but not limited to payment disputes with contractors, subcontractors, and providers of services. The State will not mediate disputes between the Grantee and any other entity concerning responsibility for performance of work.

9.13 During the performance of this Grant Agreement, the Grantee and its contractors shall not unlawfully discriminate against, harass, or allow harassment against any employee or applicant for employment because of sex, race, religion, color, national origin, ancestry, disability, sexual orientation, medical condition, marital status, age (over 40) or allow denial of family-care leave, medical-care leave, or pregnancy-disability leave. The Grantee and its contractors shall ensure that the evaluation and treatment of their employees and applicants for employment are free of such discrimination and harassment.

9.14 Time is of the essence in this Grant Agreement. The Grantee shall proceed with and complete the Project in an expeditious manner.

EXHIBIT B

Grantee Work Statement:

Budget Summary (Attachment I)
Project Milestones (Attachment II)
Project Schedule (Attachment III)
Key Project Personnel (Attachment IV)

EXHIBIT B, Attachment I

Budget Summary

Grantee: City of Los Angeles Harbor Department

Grant No.: G09-AQIP-13

Project: Tier 4 PM Retrofit System for a Genset Switch Locomotive

Total Costs & Funding

Costs	Funding Amount
Cash Costs	
Johnson Matthey	$146,246
AQIP Funds	$346,178
Subtotal Cash Costs	**$492,424**
In-Kind Costs	
Johnson Matthey	$158,532
Union Pacific Railroad	$41,400
Subtotal In-Kind Costs	**$199,932**
Project Costs Grand Total	**$692,356**

Disbursement of Funds:

Tier 4 PM Retrofit System for a Genset Switch Locomotive Funding

The Grantee shall receive demonstration technology funds in accordance with section 3.7-3.10 of these provisions and the disbursement schedule in Exhibit B Attachment II.

Project Administration

Project Administration Funding is limited to $20,000 and will be disbursed in accordance with section 3.7-3.10 of these provisions and the disbursement schedule in Exhibit B Attachment II.

EXHIBIT B, Attachment II

Disbursement Schedule

Grantee: City of Los Angeles Harbor Department

Grant No.: G09-AQIP-13

Project: Tier 4 PM Retrofit System for a Genset Switch Locomotive

Anticipated Disbursement Request Date	Milestone	Milestone Description[1]	Project Funding Amount	Administration Funding Amount
December 10, 2010	Project Start	Initial Kickoff Meeting	$24,617	$10,000
March 31, 2011	1.4	Initial Test Report After DPF System is Installed (Phase 1)	$86,544	$0
~~November 14, 2011~~ June 1, 2012	2.4	Phase 2 Durability Summary Report (1,500 run hours)	$86,545	$0
~~June 15, 2012~~ May 15, 2013	3.4	Phase 3 Durability Summary Report (~~up to an additional 500 1,500~~ 3,000 run hours)	$86,545	$0
~~June 15, 2012~~ June 1, 2013	Project End	Final Meeting: and Final Report	$41,927	$10,000
		Subtotal	**$326,178**	**$20,000**
		Grand Total	**$346,178**	

[1]ARB, at it's sole discretion, may approve minor technical adjustments to these milestones.

EXHIBIT B, Attachment III

Project Implementation Schedule

Grantee: City of Los Angeles Harbor Department

Grant No.: G09-AQIP-13

Project: Tier 4 PM Retrofit System for a Genset Switch Locomotive

Detailed Scope of Work and Schedule

#	Task	~~Duration~~	Start	Finish
	AB118 Project – EPA Tier IV PM Retrofit System	~~392d~~	Fri 12/10/10	~~Fri 6/15/12~~ Wed 5/15/13
	Phase 1 – Install and Zero Hour Test Three DPF System	**~~90d~~**	**Fri 12/10/10**	**Thu 3/31/11**
1.1	Design DPF System	~~9d~~	Fri 12/10/10	Wed 12/22/10
1.2	Fabricate and install three DPF systems, one on each engine	~~73d~~	Thu 12/23/10	Mon 3/21/11
1.3	Analyze data and generate report	~~3d~~	Tue 3/22/11	Thu 3/24/11
1.4	**Deliverable: Test report after installing the DPF systems**	**~~158d~~**	**Fri 3/25/11**	**Thu 3/31/11**
	Phase 2 – Durability Test of DPF System for 1,500 Hrs	**~~158d~~**	**Fri 4/1/11**	**Mon 11/14/11**
2.1	Conduct 1,500 hour field trial	~~147d~~	Fri 4/1/11	Mon 10/24/11
2.2	Test Locomotive emissions per Part 92 and inspect DPF systems	~~5d~~	Tue 10/25/11	Mon 10/31/11
2.3	Analyze test data and generate report	~~5d~~	~~Tue 11/1/11~~ Wed 5/15/12	~~Mon 11/7/11~~ Sun 5/20/12
2.4	**Deliverable 2: Phase 2 Summary Report**	**~~1d~~**	**~~Tue 11/8/11~~ Fri 6/1/12**	**~~Mon 11/14/11~~ Fri 6/1/12**
	Phase 3 – Durability Test of DPF System for Remaining 1,500 Hrs	**~~160d~~**	**~~Tue 11/1/11~~ Fri 6/1/12**	**~~Fri 6/1/5/12~~ Wed 5/15/13**
3.1	Conduct second 1,500 hour field trial	~~155d~~	~~Tue 11/1/11~~ Fri 6/1/12	~~Mon 6/4/12~~ Wed 5/15/13
3.2	Test locomotive emission per Part 92 and inspect DPF systems	~~5d~~	~~Tue 6/5/12~~ Fri 3/15/13	~~Mon 6/11/12~~ Mon 4/15/13
3.3	Analyze test data and generate report	~~3d~~	~~Tue 6/12/12~~ Mon 4/15/13	~~Mon 6/14/12~~ Wed 5/1/13
3.4	**Deliverable: Phase 3 Summary Report (~~up to~~ 3,000 Hrs)**	~~1d~~	~~Fri 6/15/12~~ Wed 5/1/13	~~Thu 6/15/12~~ Wed 5/15/13

EXHIBIT B, Attachment IV

Key Project Personnel

Grantee: City of Los Angeles Harbor Department

Grant No.: G09-AQIP-13

Project: Tier 4 PM Retrofit System for a Genset Switch Locomotive

Name	Position	Duties
Kevin Maggay, Port of LA	Project Administrator	Provide Overall Project Management
Rick Paczewski, Johnson Matthey	Engineering Manager	Management of Product Design and Product Support
Steve Clark, Johnson Matthey	Project Coordinator	Provide Project Coordination Between all Partners
Lanny Schmid, Union Pacific Railroad	Director of Environmental Affairs	Coordinate Union Pacific's Roll in the Project
Steve Fritz, SWRI	Manager of Medium Speed Diesel Engines, Department of Emission Research and Development	Manage Emission Testing of Project Locomotive

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EXHIBIT C

Air Quality Improvement Program
Grant Disbursement Request Form

State of California
Air Resources Board
MSCD/ERIB/AQIP_79 (New 11/10)

Air Quality Improvement Program
GRANT DISBURSEMENT REQUEST FORM
Fiscal Year 2009-2010

Amount of Funds Requested for this Disbursement	
1. Project Name:	
2. Business Name:	3. Grant number:
4. Contact Person:	

	Original Grant	Total of Previous Disbursements	This Request	Remaining Balance
Project Funds	$	$	$	$
Admin. Funds	$	$	$	$
Total	$	$	$	$

Documentation attached for justification of disbursement of:

☐ Administrative Funds ☐ Project Funds

Attachments: _____

_____

Certification
I certify that the information contained in this grant disbursement request and all attachments is correct and complete and is in accordance with the grant agreement. In addition, I hereby authorize the Air Resources Board to make any inquiries to confirm this information.
_____ Signature of Authorized Official
Name:
Title:
Date:

EXHIBIT D

2009-10 Grant Proposal Solicitation

Air Quality Improvement Program (AQIP)

ADVANCED TECHNOLOGY DEMONSTRATION PROJECTS: ADVANCED LOCOMOTIVE AFTERTREATMENT TECHNOLOGIES

Mobile Source Control Division
California Air Resources Board
March 30, 2010

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California Air Resources Board
Air Quality Improvement Program (AQIP)

Advanced Technology Demonstration Project: Advanced Locomotive Aftertreatment Technologies

March 30, 2010

Table of Contents

SUMMARY

The Air Resources Board (ARB or Board) is issuing this solicitation for up to $800,000, encompassing one to four independent projects, for demonstration and administration of advanced aftertreatment technologies for use on existing medium-horsepower locomotives. This solicitation is focused at the first of two approved projects for the locomotive demonstration category. This solicitation is issued under the Assembly Bill 118 (AB 118) Air Quality Improvement Program's (AQIP), Advanced Technology Demonstration Project and is intended to fund technologies on the cusp of commercialization with the potential for significant reductions in criteria and toxic air pollutants. The issuance of the remaining locomotive category demonstration project solicitation, dealing with new cleaner locomotive engines for up to $800,000, will be issued at a later date. This competitive solicitation is open to local air districts or other public agencies that demonstrate the requisite technical and administrative expertise. All work must be completed within two years post grant award. Specific tasks are outlined within this solicitation. The proposal deadline for this solicitation is May 28, 2010.

BACKGROUND

In 2007, Governor Schwarzenegger signed into law the *California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007* (AB 118, Statutes of 2007, Chapter 750). The Act created the AQIP, a voluntary incentive program administered by ARB, to fund clean vehicle and equipment projects, air quality research, and workforce training. ARB's appropriation for AQIP projects in the Fiscal Year (FY) 2009-10 State Budget is $42.3 million[1]. Based on projected revenues for the AQIP in FY 2009-10, ARB estimates about $30 million will be available for grants.

In April 2009, ARB adopted the AQIP Guidelines and the AQIP Funding Plan for FY 2009-10 (Funding Plan). The AQIP Guidelines establish minimum administrative and implementation requirements for the AQIP, while the Funding Plan serves as the blueprint for expending FY 2009-10 AQIP funds. The Funding Plan focuses the AQIP on supporting development and deployment of the advanced technologies needed to meet California's longer-term, post 2020 air quality goals, and directs about 21 percent of FY 2009-10 AQIP funds to Advanced Technology Demonstration Projects.

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[1] In the *AB118 Air Quality Improvement Program Funding Plan for Fiscal Year 2009-10*, the Board approved $2 million for the Locomotive Demonstration Projects based on a $42.3 million appropriation for AQIP projects in the proposed State Budget. The Funding Plan included provisions to scale funding targets proportionally based on the final budget allocation. Projected revenue for the AQIP in FY 2009-10 is estimated to be about $30 million rather than $42.3 million, therefore Locomotive Demonstration Projects funding has been adjusted to $1.6 million total for both projects .

ARB's goal under the Advanced Technology Demonstration Projects is to fund emerging strategies that are near deployment (less than three years from commercial application and past the initial research and development stage); and that have the potential of providing real and surplus cost effective emission reductions in criteria and toxic air pollutants, with greenhouse gas reductions as a possible co-benefit. A significant investment of AQIP funds in the locomotive category can yield large emission reductions, and accelerate implementation of new cleaner technologies in this transportation sector. The April 2009 Board approved Funding Plan allows for the following two types of locomotive demonstration projects:

- Demonstration of advanced aftertreatment technologies for use on existing medium-horsepower locomotives.
- Demonstration of new, cleaner locomotive engines that meet or exceed the Low-Emitting Locomotive emission level (4.0 g NOx per bhp-hr and 0.1 g PM per bhp-hr)

This competitive solicitation is the first of two grant opportunities to be awarded for locomotive projects and will be focused on the demonstration of advanced aftertreatment technologies. The second solicitation is planned for release in early 2010 and will cover the demonstration of new, cleaner locomotive engines.

NEED FOR EMISSION REDUCTIONS FROM LOCOMOTIVES

In December 2009, after an extensive public evaluation, ARB staff presented to the Board the Technical Options to Achieve Additional Emissions and Risk Reductions from California Locomotives and Railyards document. The purpose of this document is to provide a sound technical basis guiding the discussion on how best to achieve emissions reductions of oxides of nitrogen (NOx) and diesel particulate matter (PM).

Emissions from locomotives operating in California have been determined to elevate the exposure of cancer causing diesel PM in the area's surrounding major railyards. Staff estimated in the technical options document that maximum individual caner risks were as high as 500 to 2,500 in a million near some of the States major railyards. A mid-term (up to 10 years) option identified in the technical options document is the retrofit of existing locomotives to reduce the emissions of diesel PM. Installing retrofits on locomotive engines to capture and oxidize diesel PM before being emitted into the atmosphere can provide real emission reductions, benefiting the citizens living near railyards and operating locomotives.

In line with the guiding principles of the Funding Plan and with a modest investment of AQIP demonstration project funds we can provide added momentum toward reducing peoples exposure to criteria and toxic air pollutants by accelerating the introduction of advanced aftertreatment technologies to reduce emissions from locomotives.

Advanced aftertreatment technologies still face some technological hurdles. Sizing and durability are some of the issues that need to be overcome with locomotive retrofits. To

date, neither the ARB nor the United States Environmental Protection Agency (USEPA) has verified any aftertreatment devices for locomotives. Major locomotive engine manufacturers are currently developing and testing aftertreatment devices to meet future Tier 4 off-road engine standards. The specific timing of this AQIP solicitation adds to the synergy of recent technological development and pushes the envelope for aftertreatment retrofits on existing locomotives operating in California communities.

ELIGIBILITY

The ARB is soliciting proposals for a Grantee to administer and implement the demonstration project for advanced locomotive aftertreament technologies. This competitive solicitation is open to local air districts or other public agencies to act as the lead agency providing administration and oversight for the demonstration project. Interested private sector parties, i.e. technology demonstrators must partner with an air district or other public agency in submitting a demonstration project application.

An air district or other public entity can request demonstration project funds, without an identified technology demonstrator, with a commitment to solicit for an advanced aftertreatment locomotive project once funds are secured from ARB via this competitive solicitation process.

If a public agency is selected as the Grantee, it will be required to submit a resolution of the agencies Governing Board prior to execution of the Grant Agreement that commits the district to comply with the Advanced Technology Demonstration Project requirements and authorizes the district to accept the grant funds from ARB. If a match is committed, the board resolution shall authorize the Air Pollution Control Officer or other legally authorized official to supply sufficient funding to meet the stated match commitment.

ELIGIBLE PROJECTS/SCOPE OF WORK

This solicitation covers administration and demonstration of projects for advanced aftertreatment technologies for use on existing medium-horsepower locomotives in California. Projects funded under this solicitation must be within three years of commercialization.

The Grantee will be responsible for administration of the demonstration project and its major roles will include:

- Submission of Demonstration Project Application to ARB
- Administration of the Project
- Oversight of Technology Demonstrator
- Report to ARB on Project Status and Grant Performance
- Submission of Periodic Reports and Grant Disbursement Requests to ARB

The Technology Demonstrator's major roles in the demonstration project will include:

- Team with Air District or other Public Agency to Develop Demonstration Project Application
- Provide the Technical Expertise in Performance of the Demonstration
- Timely achievement of Stated Demonstration Project Goals
- On-Time Reporting to the Grantee on Project Status and Grant Performance

For the purpose of this solicitation, advanced aftertreatment technologies are devices that reduce the emission of oxides of nitrogen and/or diesel particulate matter, post combustion, and can include, but are not limited to, diesel particulate filters, selective catalytic reduction devices, or diesel oxidation catalysts alone or in combination, installed on existing medium horsepower locomotives with a combined horsepower range between 1,006 hp to 4,400 hp depending on type of service. Typical horsepower (hp) ranges for some service types are shown below:

- Switchers: 1,006 hp to 2,300 hp
- Switchers and Local Road Service: 2,301 hp to 2,999 hp
- Helpers and Short Haul Service: 3,000 hp to 3,299 hp
- Intrastate Line Haul Service: 3,300 to 4,400 hp
- Passenger Locomotives: 3,000 hp to 4,000 hp

This solicitation may fund such activities as pilot demonstrations, the construction and deployment of prototypes, emissions testing, and practical demonstrations of technologies with a high potential to be commercialized. It may not be used to fund basic research, design-only projects, commercial production, or marketing activities. Field applications as demonstrations of practical utility are required.

Reproducible emission testing to verify the emission benefits of the advanced aftertreatment device will be required to be performed and described in the final report, including the anticipated cost effectiveness of the advanced aftertreatment device once introduced into the market place. The emission testing procedure used to verify emission reductions should be cited in the project narrative.

The advanced aftertreatment technology must have an identifiable potential market and reasonable economics, and its commercialization should provide economic benefits to California.

Progress reports from the Technology Demonstrator shall be submitted, at a minimum of three month intervals, to the Grantee. The Grantee is responsible to forward the progress reports unaltered to the ARB within 7 business days. Additionally, every grant disbursement request shall be accompanied by a progress report that documents the time interval seeking disbursement for and the completion of specific project milestones including any specific deliverables as defined for that milestone.

A final report will be required to be submitted from the Grantee and Technology Demonstrator at the conclusion of the demonstration project. The demonstration project will not be complete until the final report has been accepted by the ARB. The format of the final report will be agreed to in advance by the grantee, Technology Demonstrator and the ARB. The final report will include, but will not be limited to, a summary of the progress reports, provide any deliverables that were committed to in the project proposal and will detail the results from any emission testing performed.

AVAILABLE FUNDING

The total funding available through this solicitation for the Advanced Technology Demonstration Project's Advanced Locomotive Aftertreatment Technologies is up to $800,000 depending on the availability of State funds. However, ARB reserves the right to increase the total grant amount, up to the $1 million as approved in the Funding Plan, without rebidding for Grantee(s), if State revenues are higher than currently projected. The estimated number of projects selected for funding is anticipated to be between one and four projects. Administrative costs may not exceed 10 percent of the total cost budget for the proposal and only 10 percent of AQIP funds may be used for administrative purposes.

REQUIRED MATCHING FUNDS

The applicant match is required to be a minimum of 50 percent of the total project budget. Of the 50 percent required match, 10 percent of funds must be committed by the applicant or demonstrator (exclusive of providing in-kind contribution). Match funding must be provided in the following manner:

1. A minimum of 10 percent from the applicant or demonstrator
2. Up to 40 percent through some combination of in-kind contributions such as labor, equipment, materials, equipment transportation, private financing and federal or state funds.

Project facilities, laboratories, or property will not be considered as part of a proposed in-kind match whether owned or leased by the Grantee or Technology Demonstrator.

If a third party, (i.e., a party other than the grantee or technology demonstrator) proposes to provide any part of the required match, the applicant must include a letter from each third party stating that it is committed to providing a specific dollar value of cost sharing and the source of such funds. An applicant and its partners must demonstrate technical and fiscal resources sufficient to meet their cost share commitment and complete the proposed project.

PROPRIETARY INFORMATION AND INTELLECTUAL PROPERTY

ARB can keep confidential, only certain types of information provided in proposals that have been submitted in response to solicitations. Data on actual emissions to the air

cannot be protected from disclosure. Any information determined to be a trade secret or otherwise exempt from disclosure under the Public Records Act or other provisions of law must be labeled "confidential." Review Appendix A, Section D for procedures for handling confidential information. If you wish to include confidential information, you must:

- Complete the Confidentiality Provision (Appendix A, Section D) and attach it to your proposal
- Separate confidential pages from the other elements of the proposal (do not include any confidential information in the main proposal)
- Clearly label every confidential page as "CONFIDENTIAL"

Proposals will be reviewed by ARB staff and may include reviewers outside the ARB associated with public universities in California and other State government agencies as needed, all of which can protect confidential information according to confidentiality agreements with ARB. In the proposal, at the point where the information would appear if it were not confidential, please indicate its existence under the separate cover. Please provide the name, address, and telephone number of the individual to be contacted if ARB receives a request for disclosure of the information claimed as confidential.

APPLICATION REQUIREMENTS

Eligible applicants must meet all applicable requirements of State law, the AQIP Guidelines, Funding Plan, and this solicitation. To be considered for the grant award, applicants must complete the project application and demonstrate that they meet the required solicitation elements. ARB may request clarification regarding application responses during the application review process.

Please enclose with your proposal any documents (or pertinent excerpts) that you cite in support of performance claims in your proposal. However, do not include materials that are not needed to supply the information requested in these instructions. ARB will not review patent documents, engineering drawings and specifications, or promotional materials.

APPLICATION PROCESS

The application packet contains the application and information necessary for submittal of a complete application. ARB shall select Grantee(s) in compliance with the AQIP Guidelines, this solicitation and applicable State law. Demonstration project Grantee selection will be based upon the scoring criteria identified in this solicitation

If you need this document in an alternate format or language, please contact Johanna Levine at (916) 324-6971 or jlevine@arb.ca.gov . TTY/TDD/Speech to Speech users may dial 711 for the California Relay Service.

Four signed original copies and one CD of the application, including all the required documents, in MS Word 2003 or PDF format, must be received at the Air Resources Board headquarters at 1001 I Street, Sacramento, CA 95812.

Applications submitted by U.S. Postal Service mail must be postmarked by May 28, 2010. Items delivered by UPS, Express Mail, Federal Express or another delivery service provider (other than U.S. Postal Service) must be received by the delivery service provider by May 28, 2010 at 5 p.m. (delivery service provider tracking number may be used to verify date of receipt). Applications must be mailed to the following address:

Johanna Levine
Air Resources Board
Mobile Source Control Division
1001 I Street, P.O. Box 2815
Sacramento, CA 95812

Please send an email to Johanna Levine at jlevine@arb.ca.gov identifying that you have submitted an application. ARB will confirm with the applicant that the application was received.

No applications may be submitted by fax or email.

Solicitation Timelines	
Public Release of Solicitation	March 30, 2010
Applicant Workshop	April 27, 2010
Application Deadline	May 28, 2010 5:00 PM
Review/Rating of Applications	June 1- June 11, 2010
Grantee Selected	June 14, 2010

Timelines are subject to change at ARB's sole discretion.

Applicants Workshop

ARB will hold an Applicants Workshop at which time staff will be available to answer questions potential applicants may have regarding eligibility, application completion and other issues.

The Applicant Workshop and conference call will be at:

Date:	April 27, 2010
Time:	1:30-3:00 PM
Place:	Cal/EPA Headquarters 1001 I Street, Sacramento Conference Room 2410
Call-in Number:	1-888-456-0337
Passcode:	31910

The workshop will be open to all interested entities. A call-in phone number is provided for those unavailable to attend in person. The intent of the workshop is to provide potential applicants with an opportunity to ask clarifying questions regarding general application or applicant requirements or terminology definitions. Written questions submitted before the workshop will be given priority. Questions may be e-mailed to Mr. Earl Landberg at elandber@arb.ca.gov and may be submitted up to 5 p.m. two days prior to the workshop. The questions and answers from the workshop and any questions received via e-mail by 5 p.m. on April 26, 2010 will be posted on the ARB website no later than 5 p.m. on May 4, 2010. ARB will not answer questions regarding this solicitation after the Applicant Workshop. Any verbal communication with an ARB employee concerning this solicitation is not binding on the State and shall in no way alter a specification, term or condition of the solicitation.

APPLICATION CONTENT AND ORGANIZATION

The ARB strongly encourages applications to be accurate, brief and clear. Applications will be initially screened for completeness. The application packet for this solicitation is included in Appendix A, and includes the following elements:

A. Applicant Information and Qualifications
B. Project Description
C. Proposed Budget
D. Confidentiality Provision
E. Letters of Commitment

Completed applications should be assembled in the above order when submitted.

EVALUATION AND SCORING

The ARB will evaluate each application based on the criteria described below, the maximum score is 100 points. Qualified applicant(s) with the highest overall score(s) will be selected for funding. If more than one project is to be funded under this solicitation the total amount funded for all projects will not exceed $800,000. If more than one project is selected for funding and the total for both projects exceeds

$800,000, ARB will award to the highest scored proposal, the remaining dollars, if any, may be awarded to the next highest scored proposal based on the funding available. ARB may negotiate the terms for any remaining funds based on the funding limitation. If no agreement can be reached, ARB may negotiate with the next highest scored proposal until an agreement is reached. If no agreement can be reached, ARB reserves the right, in its sole discretion throughout this process to not award a grant and redirect the funds to other AQIP projects.

Successful applicants will be required to sign a grant agreement with ARB to fulfill the administrative duties and technical duties associated with the project (see Appendix B for a Sample Draft Grant Agreement)

In any event, if in the ARB's sole discretion no submitted proposal meets the goals of this solicitation, Funding Plan or AQIP Guidelines, no selection of a Grantee or Technology Demonstrator will be required to be made and funding can be directed to another project in the Funding Plan as needed.

Summary of Scoring Criteria for Demonstration Projects

	Scoring Criteria	**Points**
1	Relevance to the Solicitation Objective and Potential Emission Reduction Benefits	20
2	Budget, Match Funding and In-Kind Services	15
3	Work Plan	10
4	Technology and Innovation	15
5	Application Completeness	10
6	Potential for Market Penetration and Commercialization of the Technology	10
7	Environmental Justice	5
8	Project Team Capabilities and Degree of Industry Collaboration	10
9	Timeline for Project Completion	5
	TOTAL	100

The **PROJECT NARRATIVE** must separately address each of the scoring criteria listed below; see instructions for the project narrative in Appendix A Section B.

1. **Relevance to the Solicitation Objective and Potential Emission Reduction Benefits** **20 Points**

- Describe how the project meets ARB's goal under the Locomotive Advanced Technology Demonstration Projects as described in this solicitation and the Funding Plan.
- Describe the estimated cost effectiveness of the technology to the extent practical in dollars per ton of criteria pollutant reduced using current Carl Moyer Program methodology. This methodology, relevant tables and instructions are included in

Appendix C of this solicitation. Provide a clear and concise description of the methodology employed in determining any potential greenhouse gas emission reductions.

- Describe the utility of the innovative technology to help California achieve its air quality goals.

2. Budget, Match Funding and In-Kind Services — 15 Points

- Provide a clear and concise project budget that lists all expenditures for the project in a logical sequence that leads to on-time completion of the project. See sample budget in Appendix A, page A-7.
- Demonstrate that the applicant and/or technology demonstrator will be financially capable of providing the minimum 50 percent match requirement of the total project budget (including the 10 percent cash requirement exclusive of in-kind contributions).
- Describe each financial contribution to the project, in addition to describing other current and pending funding sources for the required cost share match. Identify if all or a portion of the match funding is dependent upon successful grant award under any other solicitation.
- Attach Letter(s) of Commitment from each third party (i.e., a party other than the organization submitting the application) stating that it is committed to providing a specific minimum dollar amount of cost sharing. Letters must be signed by the person authorized to commit the expenditure of funds by the entity.

3. Work Plan — 10 Points

- Provide a concise statement of the specific goals and objectives of the proposed project.
- In a logical sequence, describe the tasks necessary to prepare for and conduct a practical demonstration of the innovative technology. Tasks should be divided into the phases of the project, as appropriate, and described in enough detail for reviewers to understand the scope of the work.
- Provide quantitative milestones for each budget period of the project, and identify them with a title and planned completion date. The general duration for each task should be specified.
- Identify the test sites, data to be collected, the conditions under which they will be collected, and the test methods.
- Indicate the budget and source of funding for each task and what entity (applicant or industry partner) will perform the task.

- Identify the resources (e.g., equipment, machine and electronic shops, field and laboratory facilities, materials, etc.) to be used at each performance site listed. Describe only those resources that are directly applicable to the proposed work. List important items of equipment already available for this project. If proposing an equipment acquisition, describe comparable equipment, if any, already at your organization and explain why it cannot be used.

4. Technology and Innovation **15 Points**

- Identify and describe the technological innovation that is the basis for the proposal. If the innovation is a component of a device or process, also describe the device or process. Descriptions should be understandable to reviewers who are not expert in the field. Cite (but do not include) patents if needed. Describe exactly what part of the technology is innovative, how it is innovative, and how it works.
- Explain the technical advantages of the innovation and document performance claims.
- Describe what type of emission testing has already been done in relation to locomotive engine retrofits and what types of devices have already been installed on locomotive engines.

5. Application Completeness **10 Points**

- Applications that are clear, concise, and include all the requested information will be scored higher than those that are unclear or missing information.

6. Potential for Market Penetration and Commercialization of the Technology
10 Points

- Define target markets and explain why the targeted industries would buy the innovation after a successful demonstration project. Both markets within and outside of California should be considered.
- Describe the recent and expected growths of the targeted industries.
- Identify the specific market niche for the proposed technology and describe its size and potential for growth.
- Describe any specific barriers to entry or expansion.

7. Environmental Justice **5 Points**

- Explain how the proposed project, and the expected commercialized outcome of the project technology, will benefit at risk communities or populations in environmental justice areas. Proposed projects with the potential to benefit environmental justice communities that can demonstrate how the potential project would address the

ARB's Environmental Justice policy will be scored higher. The ARB's Environmental Justice polices can be found at: http://www.arb.ca.gov/ch/programs/ej/ejpolicies.pdf

8. **Project Team Capabilities and Degree of Rail Industry Collaboration** **10 Points**

- Describe the roles and the work to be performed by each of the project's key participants, including project administration, project planning, field testing, and data collection and reporting.
- Describe the administrative and technical qualifications and capabilities of key personnel, such as education and training, research and professional experience, publications (patents, copyrights, and software systems may be provided in addition to or substituted for publications), and ability to administer similar air quality programs.
- Describe the applicant's relationship and degree of collaboration with rail industry partners on the proposed project. Describe what business alliances and partnerships will be involved in commercialization.

9. **Timeline for Project Completion** **5 Points**

- Provide a project schedule including the milestones as described in the "Project Objectives and Workplan" section. Both a tabular and graphic display (such as a Gantt chart) of the project schedule is preferred, but at a minimum a tabular display is required. Information must include task duration, start and completion dates, in addition to the milestones.
- Demonstrate that work will be accomplished within 2 years post grant award.

IMPLEMENTATION PROCESS

Meetings

Before work begins, a kick-off meeting will be held in Sacramento between the Grantee, Technology Demonstrator and the ARB project management staff. The purpose of this meeting will be to discuss the work plan, details of task performance, the project schedule, any changes to the project team, and any issues that may need resolution before the ARB-funded work begins. Meetings to discuss progress will be held at least quarterly, with telephone conference calls being acceptable upon approval of the ARB grant liaison. Site visits by ARB staff may be required at ARB's sole discretion. A final meeting, or conference call pending ARB grant liaison approval, will be held at the conclusion of the project to review the results and discuss the status of commercialization plans.

Project Funding Procedure

In order to receive a disbursement, the Grantee must submit a grant disbursement request to ARB. The grant disbursement request form must be signed by the party authorized and designated in Grant Agreement.
The initial disbursement may be up to 10% of the grant amount which can include up to 50% of the administration funds identified in the grant agreement with the remainder of the initial disbursement going to the technology demonstrator to begin work on the demonstration project.

Additional disbursement will be made following the procedure described in the Reporting and Monitoring Requirements section of this solicitation and the signed grant agreement.

Reporting and Monitoring Requirements

To insure that public funds are being used prudently, reporting on project status and monitoring the project will be required. The selected Grantee(s) must submit status reports accompanying grant disbursement requests to ARB at least every three months, but may be provided on a monthly basis if necessary for more frequent invoicing, with prior approval from ARB. These reports should contain the following information, at a minimum in either MS Word 2003 or PDF formats if submitted electronically:

- Summary of work completed since the last progress report, noting progress toward completion of tasks and milestones identified in the work plan
- Statement of work expected to be completed by the next progress report
- Notification of problems encountered and an assessment of their effects on the project's outcome

A final report is required at the end of the project and must include:

- A description of the project's goals and objectives, methods, results of the demonstration, and future application of the technology.
- An update on the commercialization prospects

Requests for additional information may be required by ARB, at its sole discretion, to evaluate reports and to determine if a quarterly or final report is complete.

Any change in the project budget, re-definition of deliverables, or extension of the project schedule must be approved in advance by the ARB grant liaison in writing.

Once a grant is in place, the ARB will not require additions to the work to be done or other project scope changes under the grant. Minor changes to the work to be done or other project scope changes may be considered by ARB, in consultation with the

Grantee or Technology Demonstrator. ARB will not terminate a grant because of minor technical difficulties or minor under-accomplishment of stated project objectives, in ARB's sole discretion. However, ARB reserves the right to terminate a grant if ARB determines, in its sole discretion, that the objectives cannot be reached or that the Grantee, Technology Demonstrator or its subcontractors cannot perform the required work or as specified in Section 6 of the grant agreement.

The Grantee and Technology Demonstrator must allow ARB, the California Department of Finance, the California Bureau of State Audits, or any authorized designee access, during normal business hours, to conduct reviews and fiscal audits, or other evaluations. Granting of access includes, but is not limited to, reviewing project records, site visits, and other evaluations as needed. Project evaluations or site visits may occur unannounced as ARB staff or its designee deem necessary.

EXHIBIT E

Tier 4 PM Retrofit System for a Genset Switch Locomotive Application

LOCOMOTIVE ADVANCED TECHNOLOGY DEMONSTRATION PROJECTS APPLICATION

Please print clearly or type all information on this application.

A. Applicant Information

1. Air District or Public Entity Name: City of Los Angeles, Harbor Department (Port of Los Angeles) and City of Long Beach, Harbor Department (Port of Long Beach)		
2. Business Type: Port Authority		
3. Contact Name and Title: Mr. Kevin Maggay, Air Quality Supervisor		
4. Person with Contract Signing Authority: Mr. Christopher Patton, Acting Assistant Director of Environmental Management		
5. Business Mailing Address and Contact Information: Street: 425 South Palos Verdes Street		
City: San Pedro	State: CA	Zip Code: 90731
Phone: (310) 732-3947	Fax: (310) 547-4643	
E-mail: kmaggay@portla.org		

I certify that the information given in this application and supporting documents is complete, true and correct. I will provide all information required by ARB to complete the assessment of this project application.

Printed Name of Responsible Party: Christopher Patton	Title: Acting Assistant Director of Environmental Management
Signature of Responsible Party: Christopher J. Patton	Date: 5/27/10

Third Party Certification (if applicable)

I have completed the application, in whole or in part, on behalf of the applicant.

Printed Name of Third Party: TIAX LLC	Title: Patrick Couch, Team Lead
Signature of Third Party: Patrick Couch	Date: 5/26/2010
Amount Being Paid for Application Completion in Whole or Part: $7,200	Source of Funding to Third Party: Port of Long Beach and Port of Los Angeles

Applicant Qualifications

In the application below, please include information for each key staff involved in developing, implementing, or administering the proposed project. **Attach qualification narrative and resumes for individuals listed below**.

Name: **Kevin Maggay**	Hourly rate: $100/hr
Phone: (310) 732-3947	E-mail: KMaggay@portla.org
Title: Air Quality Supervisor, Port of Los Angeles	
Expected duties: Managing, developing, and implementing air quality improvement programs regarding cargo movement	
Name: **Christopher Patton**	Hourly rate: $100/hr
Phone: 310-732-3677	E-mail: cpatton@portla.org
Title: Acting Assistant Director of Environmental Management, Port of Los Angeles	
Expected duties: Senior manager responsible for all air quality related environmental functions at the Port of Los Angeles	
Name: **Rick Paczewski**	Hourly rate: $45/hr
Phone: (484) 320-2130	E-mail: paczer@jmusa.com
Title: Engineering Manager, Johnson Matthey	
Expected duties: Management of product design and product support activities	
Name: **Saji Pillai**	Hourly rate: $45/hr
Phone: (480) 320-2132	E-mail: pillasr@jmusa.com
Title: Senior Project Manager, Johnson Matthey	
Expected duties: Mechanical design of emission control system. Responsibilities include product commissioning, troubleshooting and repair, data analysis	
Name: **Kevin Carre**	Hourly rate: $45/hr
Phone: (480) 320-2133	E-mail: carrekp@jmusa.com
Title: Senior Project Engineer, Johnson Matthey	
Expected duties: Design of controls, including instrumentation and electrical hardware, software, and data	

acquisition and reporting system. Responsibilities include product commissioning, troubleshooting and repair, data analysis	
Name: **Jason deVillers**	Hourly rate: $45/hr
Phone: (213) 453-6822	E-mail: Villijj@jmusa.com
Title: Field Service Engineer, Johnson Matthey	
Expected duties: Product support, including troubleshooting and repair, commissioning, training, preventive maintenance, and field testing	
Name: **Wassim Klink**	Hourly rate: $45/hr
Phone: (610) 341-8308	E-mail: klinkw@jmusa.com
Title: Technical Program Manager, Johnson Matthey	
Expected duties: Catalyst selection & sizing of the emissions control system. Modeling of system performance & regeneration. Input to the test plan and data analysis	
Name: **Steve Clark**	Hourly rate: $45/hr
Phone: (320) 320-2120	E-mail: clarksd@jmusa.com
Title: Sales Manager, OEM Markets, Johnson Matthey	
Expected duties: Project coordinator facilitating communication among the project partners.	
Name: **Lanny A. Schmid**	Hourly rate: $50/hr
Phone: (402) 544-2262	E-mail: laschmid@up.com
Title: Director of Environmental Affairs, Union Pacific Railroad	
Expected duties: Coordinate Union Pacific Railroad's roles and duties as a Project Partner	

Subcontractor Information

Applicants may team with other entities. However, responsibility for deliverables lies with the primary applicant and the grant will be awarded only to the primary applicant. Provide the names and information for subcontractors. Attach qualification narrative and resumes for individuals listed below.

Name: **Steve Fritz**	Hourly rate: $50/hr
Phone: (210) 522-3645	E-mail: sfritz@swri.org
Title: Manager, Medium Speed Diesel Engines, Department of Emissions Research & Development, Southwest Research Institute	
Expected duties: Test locomotive emissions at SWRI, a certified third party test facility	

B. Project Description

Project Summary

Applicant: Port of Los Angeles and Port of Long Beach
Project Director: Mr. Kevin Maggay, Port of Los Angeles
Project Title: Tier IV PM Retrofit System for a 2,100 hp Genset Switch Locomotive
Project Objective: To demonstrate application and durability of a DPF technology on a genset locomotive
Potential Benefits: 85% PM reduction (EPA Tier IV standards), with additional CO and HC reductions
Outcomes: DPF system installation, emissions testing, in-use demonstration, and ARB verification
Major Participants: Johnson Matthey, Union Pacific Railroad

The Ports of Los Angeles and Long Beach, in conjunction with Union Pacific Railroad and Johnson Matthey, propose to demonstrate a Johnson Matthey diesel particulate filter (DPF) as an aftertreatment technology on a Union Pacific Railroad three-engine, Ultra Low Emitting Switch Locomotive designed to achieve Tier IV emission standards for PM. Significant reductions in CO and HC will also be achieved.

This proposed project would transition DPF technologies, which are typically applied to on-road heavy duty vehicles and stationary diesel generators, to a locomotive application. To implement this technology, the project team requests $346,178 in California Air Resources Board (ARB) grant funding to match $346,178 in project team funding, for a total project cost of $692,356.

The demonstration unit designated for this project is a Union Pacific 2,100 hp National Railway Equipment Company (NRE) 3GS21B three generator switcher locomotive that currently moves groups of cars locally with containers to/from both ports. Johnson Matthey will design and fabricate an emission control system for a three engine genset locomotive using mainly passively regenerated DPF technology to control emissions of PM, CO, and hydrocarbons. The DPF System, which contains multiple DOC and DPF components, is expected to achieve greater than 85% PM reductions, thus meeting EPA Tier IV locomotive emissions standards. The regeneration of the filters will be studied, giving focus to the passive NO_2-based regeneration as well as the filter ash cleaning interval (goal is a minimum of six months).

The demonstration will use a two-phased approach. In Phase 1, one of three locomotive engines will be retrofitted with the Johnson Matthey Switch Locomotive DPF system. After successful base line testing at Southwest Research Institute (SwRI) in San Antonio, Texas, the locomotive will be operated at the Intermodal Container Transfer Facility (ICTF), which is a near-dock rail yard servicing the ports, to demonstrate system durability for an initial field trial of 1,500 hours (approximately three months). The DPF system will be inspected and re-tested to assess ongoing mechanical durability and conformance to EPA Tier IV requirements for PM, CO, and HC throughout this three month period.

During phase two, the DPF system will be expanded to cover all engines and the locomotive will return to service at ICTF yards for an additional field trial of 1,500 hours. The entire project would begin in Q3 2010 and is expected to take 21 months to complete. A final milestone, marking the end of the project, will be application of the DPF system to the ARB verification process as advanced aftertreatment device upon successful completion of the demonstration.

The close collaboration of all project partners, along with a track record of proven accomplishments in this area, makes this project an excellent candidate for funding and ensures that ARB's goals for emission reductions will be met. Furthermore, because the Johnson Matthey DPF technology is relatively mature, this technology is very close to commercialization, and additional project benefits will include establishment of a leading emission reduction option for the locomotive market, as well as address major environmental justice concerns in the South Coast Air Basin.

Project Narrative

Project Title: Tier IV PM Retrofit System for a 2,100 hp Genset Switch Locomotive
Funding Amount Requested: $346,178
Applicant: Port of Los Angeles and Port of Long Beach
Industry Partners: Johnson Matthey, Union Pacific Railroad

1. Relevance to the Solicitation Objective and Potential Emission Reduction Benefits

The goal of the proposed project is to demonstrate a DPF system that will reduce PM emissions on a 2,100 HP genset switcher. Historically, DPFs have been successfully applied to on-road trucks and stationary diesel generators with PM reductions of greater than 85% routinely achieved. However, application of DPF technology on locomotives in the U.S. has been limited, and performance has not met expectations. This proposed project will serve to demonstrate the DPF system's durability against shock and vibration forces encountered on a switch locomotive (2,100 hp) during operation and sets out to reduce harmful PM emissions with the use of an aftertreatment device.

The proposed project is an excellent fit for the ARB Air Quality Improvement Program's Advanced Technology Demonstration Project for Advanced Locomotive Aftertreatment Technologies, which seeks to support demonstration of such devices that are on the "cusp of commercialization with the potential for significant reductions in criteria and toxic air pollutants". Currently, Johnson Matthey is carrying out product evaluation work on the particulate reduction components of the proposed DPF system on a NREC 3GS21B Switch Locomotive at SwRI, which is detailed in section 4 (Technology and Innovation) . This product evaluation is funded solely by Johnson Matthey and is a testament of their continuing commitment to create emissions control technologies that are best-in-class and cost effective for locomotive applications. The experience obtained from the preliminary testing will be directly applied to the system proposed for this demonstration.

The final deliverable for this proposed project will be marked by pursuing ARB verification for the DPF system applied to the switch locomotive. Acquisition of the verification will introduce a cost effective, retrofittable option for the PM emissions problem associated with railroad applications and helps California to meet its state implementation plans.

The estimated cost effectiveness of this technology, presented transparently below, is based upon the dollars per ton of criteria pollutant reduced using the current Carl Moyer Program methodology (NO_x, ROG, and PM). It is determined by dividing the total estimated installed DPF costs by the total weighted emissions reduced by the DPF over the life of the DPF system. The use of weighted reduced emissions is based upon the Carl Moyer Memorial Air Quality Standards Program (ARB, April 22, 2008). The Carl Moyer program considers NO_x, ROG and PM_{10} emission reductions in one calculation where weighting factors are applied. For NO_x and ROG emission reductions, a weighting factor of one is used. ARB has identified particulate emissions from diesel-fueled engines as toxic air contaminants and believes emission reductions of PM_{10} should carry additional weight in the calculation because, for an equivalent weight, these emissions are more harmful to human health. The ARB uses a PM_{10} weighting factor of 20. The Carl Moyer method utilizes the Annualized Cash Flow method, which multiplies the initial capital cost by a capital recovery factor to obtain an equivalent end of year annual capital cost payment.

The weighted cost effectiveness formula is:

$$\frac{\text{Total Life Cost [\$]}}{(NO_x + ROG + 20*PM_{10}) \text{ [tons reduced over the life of DPF]}}$$

The assumptions are that an existing 2007 model year switch locomotive consumes 25,000 gallons of diesel fuel per year with 100 percent operation in California. The cost of the DPF and its installation is estimated to be $150,000 for all three engines on a NRE switch locomotive. The projected life of the DPF for this analysis is 7 years. Emission reductions are calculated as follows:

Baseline Technology Information:
Switch locomotive model year: 2007
Locomotive emissions (actual measured data based upon UP2737 testing at SwRI):
NO_x = 3.00 g/bhp-hr
ROG = 0.137 g/bhp-hr
PM_{10} = 0.110 g/bhp-hr
Activity: 25,000 gal/year
Energy consumption factor (Table B-25 in Moyer Guidelines) = ECF = 18.5 bhp-hr/gal

Reduced Technology (DPF) Information:
Level 3 verified reduction of 85% for ROG and 85% for PM_{10}
Retrofit cost: $150,000
Activity: 25,000 gal/year
Energy consumption factor (Table B-25 in Moyer Guidelines) = ECF = 18.5 bhp-hr/gal

Emission Reduction Calculations:
Formula C-6 (Moyer Guidelines): Estimated Annual Emission based on Fuel Consumed using Emission Factors [tons/yr]
*Emission Factor [g/bhp-hr] * ECF [bhp-hr/gal] * Activity [gal/yr] * ton/907,200g*
Annual NO_x baseline technology emissions
3.00 g/bhp-hr * 25,000 gal/yr * 18.5 bhp-hr/gal * ton/907,200g = 1.53 ton/yr NO_x
Annual NO_x reduced technology emissions
3.00 g/bhp-hr * 25,000 gal/yr * 18.5 bhp-hr/gal * (1-0.00) * ton/907,200g = 1.53 ton/yr NO_x
Annual ROG baseline technology emissions
0.137 g/bhp-hr * 25,000 gal/yr * 18.5 bhp-hr/gal * ton/907,200g = 0.070 ton/yr ROG
Annual ROG reduced technology emissions
0.137 g/bhp-hr * 25,000 gal/yr * 18.5 bhp-hr/gal * (1-0.85) * ton/907,200g = 0.010 ton/yr ROG
Annual combustion PM_{10} baseline technology
0.110 g/bhp-hr * 25,000 gal/yr * 18.5 bhp-hr/gal * ton/907,200g = 0.056 ton/yr PM_{10}
Annual combustion PM_{10} reduced technology emissions
0.110 g/bhp-hr * 25,000 gal/yr * 18.5 bhp-hr/gal * (1-0.85) * ton/907,200g = 0.008 ton/yr PM_{10}

Formula C-10 (Moyer Guidelines): Annual Surplus Emission Reductions by Pollutant [tons/yr]
Annual Emissions for Baseline Technology - Annual Emissions for Reduced Technology
NO_x emission benefits = 1.53 tons/yr - 1.53 tons/yr = 0.00 tons/yr NO_x
ROG emission benefits = 0.070 tons/yr - 0.010 tons/yr = 0.060 tons/yr ROG
PM_{10} emission benefits= 0.056 tons/yr - 0.008 tons/yr = 0.048 tons/yr PM_{10}

Formula C-2 (Moyer Guidelines): Annual Weighted Surplus Emission Reductions
*NO_x reductions [tons/yr] + ROG reductions [tons/yr] + 20 * PM_{10} reductions [tons/yr]*
0.00 tons/yr + 0.060 tons/yr + 20 * (0.048 tons/yr) = 1.02 weighted tons/yr

Annualized Cost:
Project Life: 7 years
Capital Recover Factor (CRF) (Table B-1 in Moyer Guidelines) = 0.167
Formula C-14 (Moyer Guidelines): Incremental Cost.

*Cost of Reduced Technology [$] * Maximum Eligible Percent Funding Amount*
$150,000 * 100% = $150,000

Formula C-12 (Moyer Guidelines): Annualized Cost (no incremental of cost element)
*CRF * incremental cost [$]*
0.167 * $150,000 = $25,050/yr

Cost-Effectiveness:
Formula C-1: Cost-Effectiveness of Weighted Surplus Emission Reductions [$/ton]
Annualized Cost [$] / Annual Weighted Surplus Emission Reductions [tons/yr]
$25,050/yr / 1.02 weighted tons/yr = **$24,600/tons of weighted surplus emissions reduced**

2. Budget, Match Funding and In-Kind Services

The total budget for this project is $692,356, of which Johnson Matthey is committing $146,246 in cash match funding (21% of total). In addition, the Ports and our partners are offering in-kind services valued at $199,932 (29% of total). Details can be found in Section C Proposed Budget.

3. Work Plan

The goal of the proposed project is to demonstrate a DPF system that will reduce PM emissions on a 2,100 hp genset switcher locomotive. This proposed project will serve to demonstrate the DPF system's durability during operation and sets out to reduce harmful PM emissions. The work plan in Table 1 assumes grantee selection by June 14, 2010. Each specific task and milestone ensures the successful and on-time completion of the proposed project.

Table 1. Proposed Work Plan

#	Task	Duration	Start	Finish
	AB118 Project – EPA Tier IV Retrofit System	**413d**	**Thu 7/1/10**	**Fri 1/26/12**
	Phase 1 - Install and Test Single DPF	**241d**	**Thu 7/1/10**	**Thu 6/2/11**
1.1	Identify locomotive and send it to test facility	30d	Thu 7/1/10	Wed 8/11/10
1.2	Conduct baseline emissions testing	5d	Thu 8/12/10	Wed 8/18/10
1.3	Inspect and measure locomotive for design of custom DPF	5d	Thu 8/12/10	Wed 8/18/10
1.4	Analyze data and generate report	10d	Thu 8/19/10	Wed 9/1/10
1.5	**Deliverable: Baseline test report**	1d	Thu 9/2/10	Thu 9/2/10
1.6	Design DPF System	40d	Thu 8/19/10	Wed 10/13/10
1.7	Fabricate and install DPF system on one engine	45d	Thu 10/14/10	Wed 12/15/10
1.8	Test locomotive emissions per Part 92	5d	Thu 12/16/10	Wed 12/22/10
1.9	Analyze data and generate report	10d	Thu 12/23/10	Wed 1/5/11
1.10	**Deliverable: Initial test report after installing DPF**	1d	Thu 1/6/11	Thu 1/6/11
1.11	Conduct 1,500 hour field trial (100 days estimated)	100d	Thu 12/23/10	Wed 5/11/11
1.12	Test locomotive emissions per Part 92 and inspect DPF system	5d	Thu 5/12/11	Wed 5/18/11
1.13	Analyze test data and generate report	10d	Thu 5/19/11	Wed 6/1/11
1.14	**Deliverable: Phase 1 Summary Report**	1d	Thu 6/2/11	Thu 6/2/11
	Phase 2 - Install and Test Three DPFs	**188d**	**Thu 5/12/11**	**Fri 1/26/12**
2.1	Make design changes if needed	10d	Thu 5/12/11	Wed 5/25/11
2.2	Fabricate and install two additional DPF Systems	45d	Fri 6/3/11	Thu 8/4/11

2.3	Conduct baseline emissions test on combined exhaust for 3 engines	5d	Fri 8/5/11	Thu 8/11/11
2.4	Analyze data and generate report	10d	Fri 8/12/11	Thu 8/25/11
2.5	**Deliverable: Test report after installing 2 additional DPFs**	1d	Fri 8/26/11	Fri 8/26/11
2.6	Conduct 1,500 hour field trial (100 days estimated)	100d	Fri 8/12/11	Thu 12/29/11
2.7	Test locomotive emissions per Part 92 and inspect DPF systems	5d	Fri 12/30/11	Thu 1/5/12
2.8	Analyze test data and generate report	10d	Fri 1/6/12	Thu 1/19/12
2.9	**Deliverable: Phase 2 Summary Report**	1d	Fri 1/20/12	Fri 1/20/12
2.10	Return locomotive to original condition	5d	Fri 1/20/12	Thu 1/26/12

4. Technology and Innovation

Passive DPF regeneration has been utilized successfully in various heavy-duty diesel applications for more than 10 years. Johnson Matthey's Continuously Regenerating Technology (CRT®) was introduced into the European market in the mid 1990s, and since that point, over 150,000 CRT® systems have been successfully applied in retrofit applications worldwide. The majority of these systems are used in on-road applications, but the technology has been successfully demonstrated by Johnson Matthey in non-road applications and, more recently, in stationary engine applications.

The proposed Johnson Matthey Switch Locomotive System in this project is a one box, multiple DOC/catalyzed soot filter (CSF) system. It operates under the same principles that have made the operation of the above systems successful. These principles are summarized below, and their application to locomotives for this demonstration project is discussed. This system is distinguished by two primary technical advantages over other technologies to date in that the DPF regenerates at a lower temperature than other passively regenerating DPF's and the system is designed to minimize back pressure on the engine. Lower DPF regeneration temperatures are important in a switch locomotive application because locomotives idle much of the time at exhaust temperatures than are too low for other types of DPF's. The lower back pressure feature increases the service life between filter cleanings.

Principles of Johnson Matthey Passive Regeneration

Removing PM from the diesel exhaust and trapping it within a filter is now well-established technology. Numerous different filters can be used to obtain effective PM filtration, including wall flow filters and partial filters. The key requirement is to be able to combust this accumulated soot to maintain low operating back pressure and to prevent filter plugging. The Johnson Matthey system uses the discovery that NO_2 combusts diesel soot at much lower temperatures than oxygen does. Using a DOC upstream of an uncoated diesel particulate filter, NO in the exhaust is oxidized to NO_2, and the NO_2 is then utilized in the filter to oxidize the soot to CO and CO_2. The temperature dependence of the NO oxidation activity of a platinum-based oxidation catalyst optimized for NO_2 generation is shown in Figure 1. It can be seen that the temperature for the onset of significant NO oxidation activity is approximately 200°C. The activity then rises rapidly and reaches a maximum at approximately 300°C. The NO conversion then decreases as a result of thermodynamic constraints. Note, however, that while the NO oxidation activity falls below 20% at 500°C, this is the temperature at which the oxygen can start to combust the PM, i.e., the O_2-PM reaction takes over. In addition, when the engine is generating temperatures of the order of 500°C in the exhaust, the engine-out NO_x level is high, so even a 20% conversion of this NO into NO_2 will provide a high absolute level of NO_2 to the filter. Therefore, the Johnson Matthey system can provide very effective PM control at all temperatures from approximately 250°C upwards.

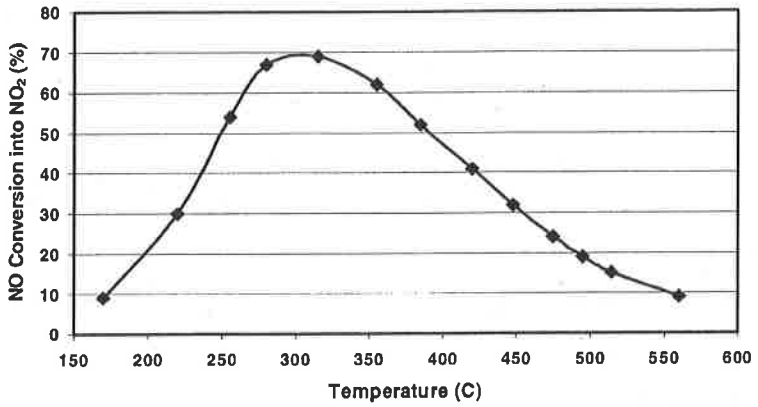

Figure 1. Temperature Dependence of the NO Oxidation Activity of a Pt-based Catalyst

Since the vast majority of the NO_x emitted from diesel engines is in the form of NO, an oxidation process is required to oxidize a portion of the NO into NO_2, to enable the subsequent low temperature reaction between NO_2 and soot. This oxidation can be affected in a number of ways, but the most common way is to use a catalyst located either upstream of the filter or coated onto the filter itself. Previous work by Johnson Matthey has clearly demonstrated that significantly better low temperature system performance is obtained when an upstream DOC is used.[1]

Within the Johnson Matthey system, the oxidation catalyst, which is optimized for the NO oxidation reaction, also has very high activity for both CO and HC oxidation. Table 2 shows the typical performance of the Johnson Matthey CRT® system over the European Stationary Cycle on a Euro I engine.

Table 2. Performance of the CRT System on a Euro I Engine (ESC Test Cycle; g kW-1hr-1)

	HC	CO	NO_x	PM
Engine-Out	0.162	0.989	7.018	0.163
Tailpipe-Out	0.003	0.002	6.874	0.008
EuroIV Limits	*0.460*	*1.500*	*3.500*	*0.020*

The HC and CO are reduced to levels that are barely detectable, and the PM is reduced to a level which is comfortably below the 2005 Euro IV legislated level, even on this engine with relatively high emissions. During the soot combustion process the NO_2 is mainly reduced back to NO, such that the system does not provide a significant amount of NO_x conversion.

This CRT® system has been further optimized by Johnson Matthey with the introduction of the CCRT® system by applying a coating to the filter, which has been shown to significantly enhance the passive regeneration potential of the system.[2]

To compare CCRT® performance, the back pressure in various systems was measured at a challenging maximum test cycle temperature around 270°C. Figure 2 shows the evolution of the back pressure during the experiments with the three different filter systems. An uncoated DPF was also used as a reference in this work – this DPF was unanalyzed and had no catalyst in front of it, so no carbon regeneration would be seen with this system.

[1] For details, please refer to SAE 2002-01-0428.
[2] For details, please refer to SAE 2002-01-0428.

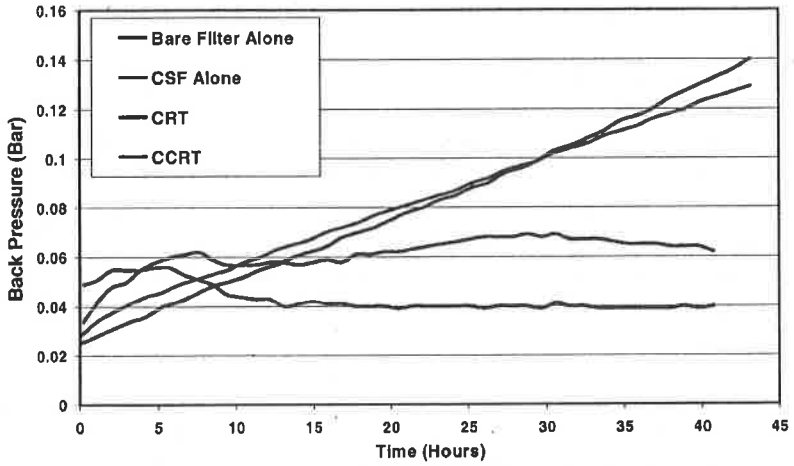

Figure 2. Back Pressure Profiles of Different Filter Systems during Low Temperature Cycles

It can be seen that the back pressure of the bare filter rises linearly with time, corresponding to no regeneration in this system. The CSF-only system has a very similar back pressure profile, revealing that it has very poor passive regeneration over this low temperature cycle. The CRT® performs significantly better than the CSF over this low temperature cycle, with the back pressure stabilizing at a low and stable level. This is in spite of the fact that the CRT® system contains significantly less platinum than the CSF. The CCRT® system is the best of all the systems, with the back pressure stabilizing at the lowest level.

In addition, long term aging at 550°C has been conducted on the DOC used in the Johnson Matthey system. The pre-filter DOC was aged in an oven for 100h at 550°C, and testing indicated no deterioration of the catalyst, demonstrating the long-term thermal durability of the DOC formulation used in this project.

Application of the CCRT® System to a Locomotive Engine

The system proposed for this project is a modified version of Johnson Matthey's CCRT®. For the locomotive application, the system consists of multiple DOC and CSF pairs. The sizing of the system and the choice of specific DOC and CSF formulations depends on the exhaust characteristics of the engine (temperature, exhaust flow, and NO_x and PM rates). Johnson Matthey has conducted baseline testing on a Model Year 2007 QSK19 engine at SwRI and developed a good understanding of the engine out temperature, exhaust flow, and emissions. Based on these conditions, an alpha system was designed and was installed on one of the engines of a three-engine Union Pacific locomotive (Figure 3).

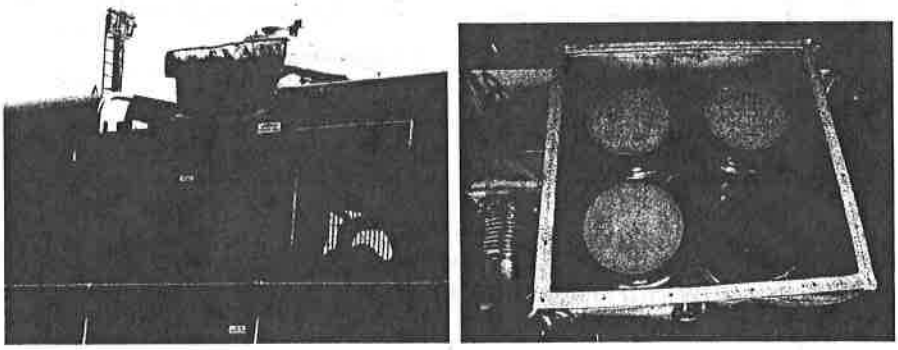

Figure 3. CCRT® system installed on a Union Pacific switch locomotive (left); close up of the internals of a multiple pair CCRT® system (right)

The system was run for 40 hours under idling conditions to accumulate soot up to 3 g/L. A small pressure drop increase was observed. After soot accumulation, the system was run under Notch 3 conditions for 1.5 hours and a drop in the pressure drop was observed during the first 45 minutes of running the filter is this condition, indicating passive regeneration of the filters under Notch 3 conditions (Figure 4). Furthermore, when the filter system was operated in Notch 1 for 6 hours, there was no observed increase in the pressure drop (Figure 5) even though the amount of particulate out of the engine during this period would amount to 3g/L of soot, without regeneration. It is unclear at this time if under Notch 1 conditions the system reached balance, however, there appears to be some regeneration present.

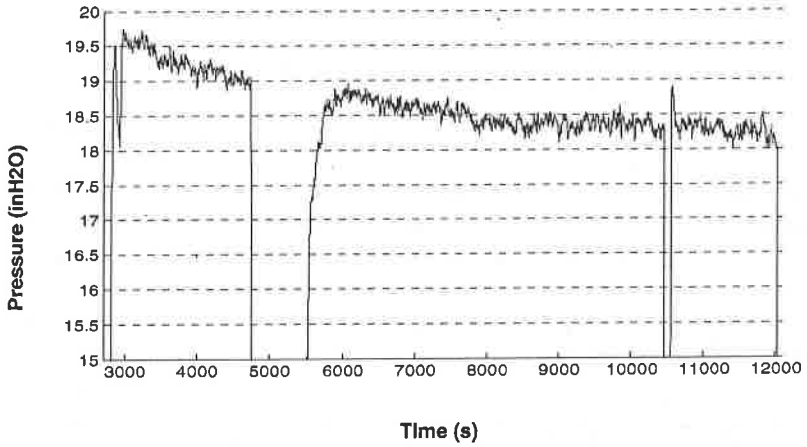

Figure 4. Pressure drop at filter inlet during 1.5 hours operation at Notch 3. Initial soot loading of the filter = 3 g/L.

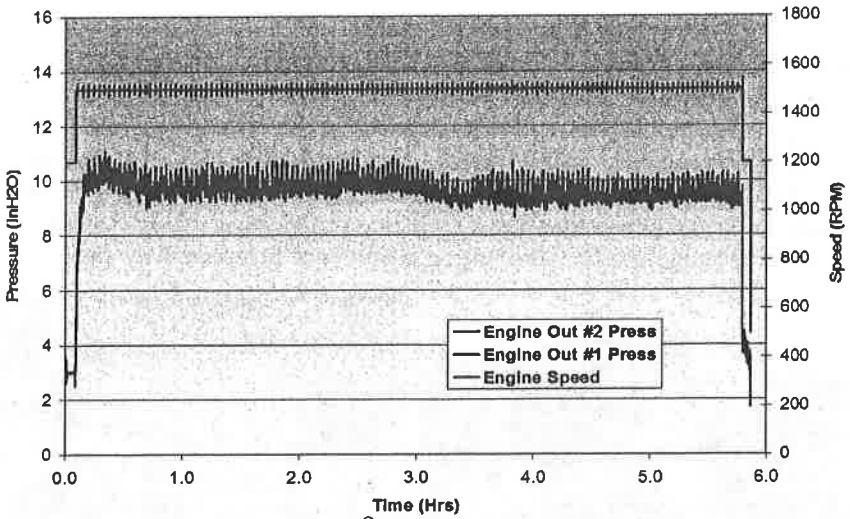

Figure 5. Pressure drop through the CCRT® system during 6 hours of operation at Notch 1. The PM out of the engine corresponds to 3 g/L soot on the filters, if no regeneration.

Emissions were also measured at the tailpipe when the system was running at Notches 1, 2 and 3. PM and CO conversions were greater than 95 percent, and HC conversion was greater than 75 percent (75 to 92 perecent) in all 3 Notches.

5. Application Completeness

This application is clear, concise, and includes all requested information to the best of our knowledge.

6. Potential for Market Penetration and Commercialization of the Technology

The most successful exhaust aftertreatment used for diesel PM emission control in the on-road market is the DPF. Application of DPF technology on locomotives in the U.S. has been limited. Successful demonstration of DPFs on existing medium-horsepower locomotives is required prior to entering the market. This project will demonstrate on a National Railway Equipment Company (NRE) switch locomotive with three 6-cylinder, 700 HP Cummins QSK19 engines (total of 2,100 HP).

There are approximately 70 NRE genset switch locomotives operating in the state of California (approximately 60 owned by UPRR operate in the LA basin). This represents a market of nearly 100 total gensets in the state of California and over 300 in the U.S. and world-wide. While Johnson Matthey will use this demonstration to enter into the California switcher market, it will be a launching point to penetrate into the switcher market of the other states as well. Furthermore, while switch locomotive engines and operation are different from those of line haul locomotives, the experience gained in this locomotive project will assist Johnson Matthey in the development of emission control systems for the broader locomotive industry.

A barrier to entry into this market is the lack of data on durability, which affects customer acceptance. A successful demonstration of the Johnson Matthey Switch Locomotive System will ease entry into the switcher market because it is expected to not only demonstrate meeting EPA Tier IV locomotive emission standards, but also show the system durability under normal rail operation. Confirmation of the design, operation, and maintenance of the DPF will also provide valuable confirmation of the estimated cost effectiveness calculations that will help targeted industries buy into the technology.

7. Environmental Justice

Direct Project Benefits for At-Risk Communities

The proposed project equipment will be demonstrated, tested and operated in the San Pedro Bay harbor, which is surrounded by the communities of Wilmington,[3] San Pedro, and East Long Beach, all communities that are disproportionately impacted by port-related air pollution by the South Coast Air Quality Management District's Environmental Justice (EJ) methodology. This is a major public health concern since the ARB designated the exhaust from diesel-fueled engines as a toxic air contaminant. The U.S. EPA also lists diesel exhaust as a mobile source air toxic. According to ARB, approximately 70 percent of the potential cancer risk from toxic air contaminants in California can be attributed to diesel PM. Communities near the ports are disproportionately impacted by port-related emissions, and it is critically important to target emissions reductions from port sources in order to address environmental justice (EJ) concerns for these disproportionately impacted communities. Since the project vehicle shall operate within the harbor and in close proximity to these communities, a direct improvement in air quality and reduced toxic exposure for local EJ communities is an important result of this project. These benefits will grow as the switcher locomotive retrofit technology is implemented locally in other similar applications. Further, in addition to providing local benefits, successful implementation of this project

[3] Wilmington is currently part of an air quality modeling field study as part of ARB's Environmental Justice program.

would also provide a cost-effective technology option for existing locomotive fleets at all West Coast ports, providing the opportunity to reduce pollution that disproportionately impacts local port communities.

ARB's Relevant Environmental Justice Policies
The proposed project supports the ARB's overarching goal to reduce disproportionate impacts on EJ communities. In addition, the project – and the anticipated widespread implementation of the DPF retrofit technology – addresses the following specific ARB Environmental Justice policies:[4]

- **Policy I: "...to integrate environmental justice into all of our programs, policies, and regulations."** Award of the requested grant funding from ARB's AQIP will directly support ARB's goal to integrate EJ into the AQIP since the project will be implemented in close proximity to several communities identified as being disproportionately impacted by air pollution.
- **Policy III: "...to work with local air districts...through the adoption of control measures and the promotion of pollution prevention programs." This policy further requires ARB to work with local air districts to develop control measures to reduce diesel particulate matter from stationary, portable, and *marine diesel engines*.** Conversion of existing switcher locomotives to retrofitted DPF operation is a technology-based pollution prevention approach that will directly support this policy. Successful completion of this project will result in a cost-effective technology option available to support the reduction of DPM from a variety of switcher locomotives.
- **Policy V: "...to assess, consider, and reduce cumulative emissions, exposures, and health risks when developing and implementing our programs."** The proposed project will reduce emissions, and thereby exposures for a community (Wilmington) that is already being studied by ARB as part of this EJ policy action.
- **Policy VI : "...to work with...air districts to develop ways to assess, consider, and reduce cumulative emissions, exposures, and health risks from air pollution through general plans, permitting, and other local actions. Work with the local air districts and others to maintain and compile a list of possible mitigation measures to reduce air pollution impacts for specific types of projects.** This project directly supports the effort to enhance the list of available mitigation measures (e.g., technology approach) available for marine sources.

8. Project Team Capabilities and Degree of Rail Industry Collaboration

The Port of Los Angeles and Long Beach have extensive history in implementing programs designed to reduce emissions associated with port activities. The landmark Clean Air Action Plan (CAAP), outlines numerous strategies to reduce air quality impacts from port operations. The ports work closely with their tenants to implement these strategies through lease requirements, tariffs, or voluntary programs. One of the largest programs under the CAAP, is the Technology Advancement Program (TAP), which aims to accelerate the verification and commercial availability of new, clean technologies for all port-related sources. US EPA Region 9, ARB, and SCAQMD serve on the TAP Advisory Committee, providing the ports with cooperation and valuable guidance from agency staff to streamline the process for reaching agreement on the benefits of new, cleaner technologies. Additionally, working cooperatively with regulatory agencies allows for leveraging limited resources to expand the pool of potential technologies.

Johnson Matthey, as the technology demonstrator, will serve as the lead on project planning: field testing, data collection, and reporting. Johnson Matthey, Inc. is a worldwide technology company and leader in providing first fit and retrofit technology for diesel vehicles and has been involved with the retrofit of diesel vehicles for more than 20 years on a worldwide basis. They have provided over 170,000

[4] "Policies and Actions for Environmental Justice", ARB, December 13, 2001.
http://www.arb.ca.gov/ch/programs/ej/ejpolicies.pdf

diesel retrofit systems worldwide with more than 50,000 of these in the U.S. Johnson Matthey has worked with the EPA, CARB, state and local governments, and industry to develop and provide advanced technology solutions to reduce emissions from both mobile and stationary sources for new and retrofit equipment. With a proven commercialization process to bring products to market through a diversified network of distributors and dealers, Johnson Matthey is the acknowledged expert in the field of passive regeneration with over a decade of experience in the development of filter systems for passive regeneration applications in the retrofit market. Many of the systems described above (DOC, CRT®, CCRT®) have been successfully applied in non-road applications. The CRT and CCRT® systems are both VERT-verified in Europe, and have been verified for non-road applications. The CRT® system was successfully demonstrated during the non-road Construction Industry Air Quality Coalition program, during which the CRT® filter systems accumulated over 2,500 hours of successful operation.

Union Pacific, as a project partner, will provide the demonstration unit from its existing fleet that operates at ICTF. Union Pacific Corporation owns one of America's leading transportation companies. Its principal operating company, Union Pacific Railroad, links 23 states in the western two-thirds of the country. Union Pacific serves many of the fastest-growing U.S. population centers and provides Americans with a fuel-efficient, environmentally responsible and safe mode of freight transportation. Union Pacific's diversified business mix includes Agricultural Products, Automotive, Chemicals, Energy, Industrial Products and Intermodal. The railroad emphasizes excellent customer service and offers competitive routes from all major West Coast and Gulf Coast ports to eastern gateways. Union Pacific connects with Canada's rail systems and is the only railroad serving all six major gateways to Mexico, making it North America's premier rail franchise.

Port/Johnson Matthey/Union Pacific Collaboration
The ports and Johnson Matthey have previously collaborated through the TAP to demonstrate the CRT retrofit technology on a heavy duty engine platform. Additionally, Union Pacific is a primary rail service provider to the ports and is responsible for operating the ICTF. The ports are confident that both Johnson Matthey and Union Pacific are capable of successfully completing the project and base this assessment on previous collaboration experienced in the past.

9. Timeline for Project Completion

The project schedule and milestones (tabular format) are presented in the Section 3 Work Plan and demonstrate that the proposed work will be successfully accomplished within two years post grant award.

Work Plan

Project Title: Tier IV PM Retrofit System for a 2,100 hp Genset Switch Locomotive
Applicant: Port of Los Angeles and Port of Long Beach
Industry Partners: Johnson Matthey, Union Pacific Railroad

(Note: This work plan assumes a start date of July 1, 2010. If the start date occurs before or after this date, the schedule will shift accordingly, but the tasks and duration will remain the same.)

Phase 1 - Install and Test a Single DPF (241 days, Thu 7/1/10 - Thu 6/2/11)
The scope of Phase 1 includes the testing and inspection of the locomotive to determine the size and performance required for the application. The DPF system will be installed and tested to assure conformance to Tier IV emissions specifications.

1.1 Identify locomotive and send it to test facility (30 days, Thu 7/1/10 - Wed 8/11/10)
Union Pacific must select the locomotive for the test, remove it from service, and send it to Southwest Research Institute (SwRI) in San Antonio TX for testing and inspection.

1.2 Conduct baseline emissions testing (5 days, Thu 8/12/10 - Wed 8/18/10)
The first test engine will be connected to analytical equipment and the exhaust will be analyzed to determine baseline emissions levels for CO, NO_x, PM, exhaust temperatures, and flow rates. The engine will be tested according to EPA CFR Title 40 Part 92 test methods. The data is required for technology sizing and selection.

1.3 Inspect and measure locomotive for design of custom DPF (5 days, Thu 8/12/10 - Wed 8/18/10)
The test locomotive will be inspected and measured to determine the size, shape, mounting details, and exhaust piping arrangement for the DPF system. At least one Johnson Matthey mechanical engineer and one electrical engineer will inspect the locomotive and take dimensional measurements. They will return to the home office and design the emission control system including electronic controls.

1.4 Analyze data and generate report (10 days, Thu 8/19/10 - Wed 9/1/10)
The SwRI data will be analyzed and presented in the initial report. Baseline emissions will be calculated and reported with the EPA switch locomotive duty cycle weighting applied.

1.5 Deliverable: Baseline test report (Thu 9/2/10)

1.6 Design DPF System (40 days, Thu 8/19/10 - Wed 10/13/10)
The DPF system will be custom designed to fit the available space in the locomotive and provide the PM reduction required to meet Tier IV standards while meeting the exhaust back pressure limit and expected 6 month cleaning interval.

1.7 Fabricate and install DPF system on one engine (45 days, Thu 10/14/10 - Wed 12/15/10)
Johnson Matthey will create the custom fabrication drawings and electrical schematics for the DPF system. The electro-mechanical hardware will be fabricated and then shipped to SwRI. SwRI will be contracted to install the DPF system. The existing silencer will be removed from the engine exhaust system and replaced with the DPF system. The roof of the locomotive will be modified to fit the DPF.

1.8 Test locomotive emissions per Part 92 (5 days, Thu 12/16/10 - Wed 12/22/10)
The test engine will be connected to analytical equipment and the exhaust will be analyzed to determine treated emissions levels for CO, NO_x, PM, exhaust temperatures, and flow rates. The engine will be tested according to EPA CFR Title 40 Part 92 test methods.

1.9 Analyze data and generate report (10 days, Thu 12/23/10 - Wed 1/5/11)
The SwRI data will be analyzed and presented in the initial report. Baseline emissions will be calculated and reported with the EPA switch locomotive duty cycle weighting applied.

1.10 Deliverable: Initial test report after installing DPF (1 day, Thu 1/6/11 - Thu 1/6/11)

1.11 Conduct 1,500 hour field trial (100 days estimated, Thu 12/23/10 - Wed 5/11/11)
The locomotive will be released to UP. UP will send the locomotive to the Ports for field testing at ICTF. During the field trial, Johnson Matthey will monitor the exhaust system back pressure, exhaust temperature, and duty cycles with a cell based data acquisition system. The duration of the field trial has been estimated to be 100 days assuming an operating period of 15 hours per day, 5 days per week.

1.12 Test locomotive emissions per Part 92 and inspect DPF system (5 days, Thu 5/12/11 - Wed 5/18/11)
The locomotive will be returned to SwRI and the test engine will be connected to analytical equipment and the exhaust will be analyzed to determine emissions levels for CO, NO_x, PM, exhaust temperatures, and flow rates. The engine will be tested according to EPA CFR Title 40 Part 92 test methods. The DPF system will be visually inspected to determine if electrical controls and mechanical hardware, including filters and catalyst, are still intact with no damage, loose components, corrosion, etc. A Johnson Matthey engineer will perform the visual inspection.

1.13 Analyze test data and generate report (10 days, Thu 5/19/11 - Wed 6/1/11)
The SwRI data including results of the visual inspection will be presented in the final Phase 1 summary report.

1.14 Deliverable: Phase 1 Summary Report (Thu 6/2/11)

Phase 2 - Install and Test Three DPFs (182 days, Thu 5/12/11 - Fri 1/20/12)
The scope of Phase 2 includes the installation of two additional DPF systems. The DPF system will be installed and tested to assure conformance to Tier IV emissions specifications. Lessons learned during the Phase 1 test will be applied to the Phase 2 DPF systems.

2.1 Make design changes if needed (10 days, Thu 5/12/11 - Wed 5/25/11)
During the Phase 1 tests and field trial, design improvements may be identified which will be applied to the new DPF units. Mechanical drawings, electrical schematics, and software will be revised as necessary to improve product performance and durability.

2.2 Fabricate and install two additional DPF Systems (45 days, Fri 6/3/11 - Thu 8/4/11)
Johnson Matthey will fabricate two DPF systems. SwRI staff will be contracted to install the systems. The roof of the locomotive will be modified to fit the new DPF systems.

2.3 Conduct baseline emissions test on combined exhaust for 3 engines (5 days, Fri 8/5/11 - Thu 8/11/11)

The test engines will be connected to analytical equipment and the exhaust will be analyzed to determine treated emissions levels for CO, NO_x, PM, exhaust temperatures, and flow rates. The locomotive will be tested according to EPA CFR Title 40 Part 92 test methods.

2.4 Analyze data and generate report (10 days, Fri 8/12/11 - Thu 8/25/11)
The SwRI data will be presented in the initial Phase 2 baseline report. Baseline emissions will be calculated and reported with the EPA switch locomotive duty cycle weighting applied.

2.5 Deliverable: Test report after installing 2 additional DPFs (Fri 8/26/11)

2.6 Conduct 1,500 hour field trial (100 days estimated, Fri 8/12/11 - Thu 12/29/11)
The locomotive will be released to UP. UP will send the locomotive to California for additional field testing. During the field trial, Johnson Matthey will monitor the exhaust system back pressure, exhaust temperature, and duty cycles with a cell based data acquisition system. The duration of the field trial has been estimated to be 100 days assuming an operating period of 15 hours/day, 5 days/week.

2.7 Test locomotive emissions per Part 92 and inspect DPF systems (5 days, Fri 12/30/11 - Thu 1/5/12)
The locomotive will be returned to SwRI and the test engines will be connected to analytical equipment and the exhaust will be analyzed to determine emissions levels for CO, NO_x, PM, exhaust temperatures, and flow rates. The engines will be tested according to EPA CFR Title 40 Part 92 test methods. The DPF systems will be visually inspected to determine if electrical controls and mechanical hardware, including filters and catalyst, are still intact with no damage, loose components, corrosion, etc. A Johnson Matthey engineer will perform the visual inspection.

2.8 Analyze test data and generate report (10 days, Fri 1/6/12 - Thu 1/19/12)
The SwRI data including results of the visual inspection will be presented in the final Phase 2 summary report. Baseline emissions will be calculated and reported with the EPA switch locomotive duty cycle weighting applied.

2.9 Deliverable: Phase 2 Summary Report (Fri 1/20/12)

2.10 Return locomotive to original condition - Remove DPF systems and replace silencers (5 days, Friday 1/6/12 – Thu 1/12/12)
The DPF systems will be removed from the locomotive and the original silencers will be reinstalled. The roof openings will be closed. All controls systems and data loggers will be disconnected and removed.

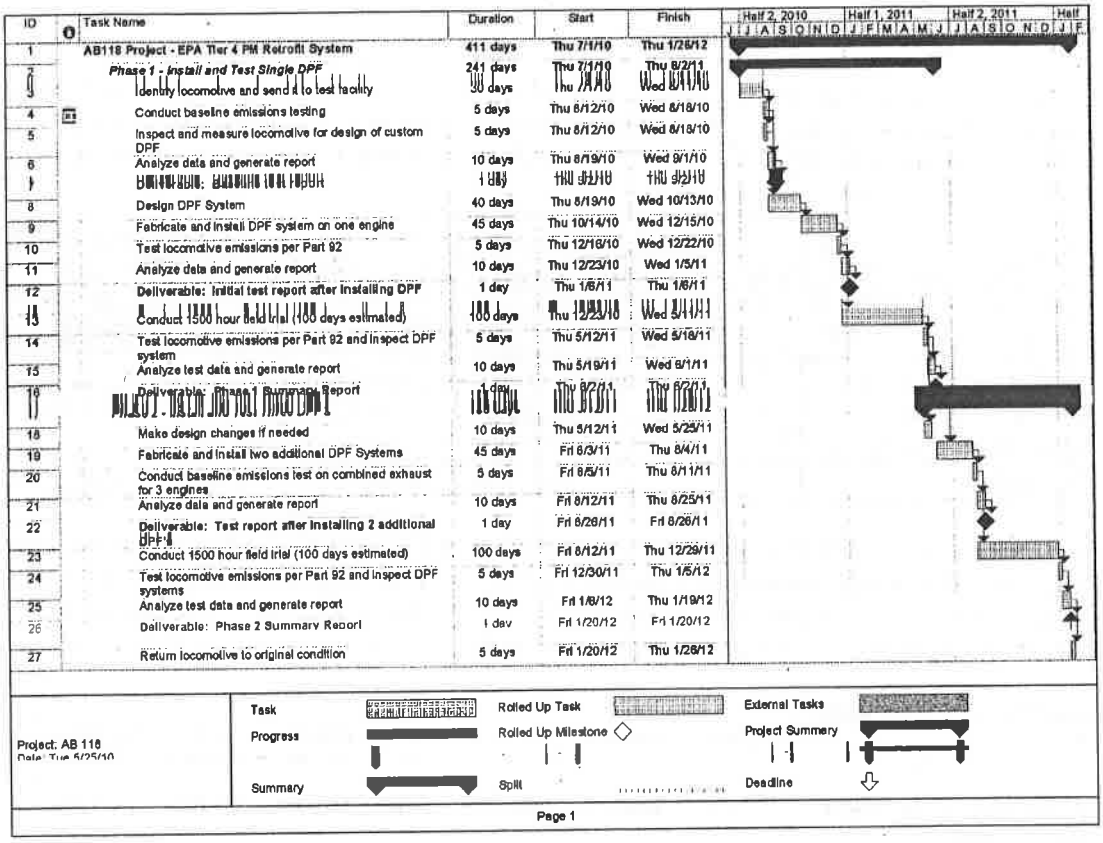

Figure 6. Project Schedule.

C. Proposed Budget

Overall Project Summary:

The Port assumes the level of effort to administrate this project, including project initiation and closeout, would entail 20 hours per quarter for the length of the project (7 quarters) in addition to 60 hours for the final report. Approximately 200 hours of labor from the Port is expected. The following table summarizes the project costs and the source of the funding.

	Labor Hours	Labor Rate ($/hr)	Total Cost	Cost Breakout by Source		
				ARB Funding	In-Kind Match	Cash Match
Port of Los Angeles	200	100	$20,000	$20,000		
Johnson Matthey			$630,956	$326,178	$158,532	$146,246
Union Pacific Railroad			$41,400		$41,400	
Total Cost			**$692,356**	**$346,178**	**$199,932**	**$146,246**

The total project cost is $692,356. ARB funding requested is $346,178 (50% for the project cost). The Port of Los Angeles' administration costs represents 3% of the project costs (well below maximum of 10%). The cash match from Johnson Matthey represents 21% of the total project costs. The in-kind matching funds represent 29% of the total project costs.

Johnson Matthey Cost Estimate

#	Task	Duration	Total Cost	Labor Cost	Labor Hours	Materials Cost	Travel Expenses	Subcontract (SwRI)	Notes
	AB118 Project – EPA Tier 4 Retrofit System	**407d**	**$630,956**	**$158,532**	**2092**	**$109,324**	**$42,000**	**$321,100**	
	Phase 1 - Install and Test Single DPF	241d	$294,928	$78,811	1040	$43,517	$18,500	$154,100	
1.1	Identify locomotive and send it to test facility	30d	$0	$0	0	$0	$0	$0	
1.2	Conduct baseline emissions testing	5d	$42,162	$6,062	80	$0	$3,000	$33,100	2 engineers (Electrical & Mechanical)
1.3	Inspect and measure locomotive for design of custom DPF	5d	$9,062	$6,062	80	$0	$3,000	$0	
1.4	Analyze data and generate report	10d	$6,819	$1,819	24	$0	$0	$5,000	
1.5	Deliverable: Baseline test report	1d	$0	$0	0	$0	$0	$0	
1.6	Design DPF System	40d	$48,499	$48,499	640	$0	$0	$0	
1.7	Fabricate and install DPF system on one engine	45d	$69,623	$606	8	$43,517	$500	$25,000	Includes installation, modifications to roof panel, fabrication
1.8	Test locomotive emissions per Part 92	5d	$72,062	$6,062	80	$0	$6,000	$60,000	Includes catalyst degreening and part 92 testing
1.9	Analyze data and generate report	10d	$6,819	$1,819	24	$0	$0	$5,000	
1.1	Deliverable: Initial test report after installing DPF	1d	$0	$0	0	$0	$0	$0	
1.11	Conduct 1500 hour field trial (100 days estimated)	100d	$0	$0	0	$0	$0	$0	

1.12	Test locomotive emissions per Part 92 and inspect DPF system	5d	$33,062	$6,062	80	$0	$6,000	$21,000	2 engineers (Electrical & Mechanical)
1.13	Analyze test data and generate report	10d	$6,819	$1,819	24	$0	$0	$5,000	
1.14	Deliverable: Phase 1 Summary Report	1d	$0	$0	0	$0	$0	$0	
	Phase 2 - Install and Test Three DPF's	182d	$272,982	$26,675	$352	$65,807	$18,500	$162,000	
2.1	Make design changes if needed	10d	$6,062	$6,062	80	$0	$0	$0	
2.2	Fabricate and install two additional DPF Systems	45d	$118,126	$1,819	24	$65,807	$500	$50,000	
2.3	Conduct baseline emissions test on combined exhaust for 3 engines	5d	$33,062	$6,062	80	$0	$6,000	$21,000	2 engineers (Electrical & Mechanical)
2.4	Analyze data and generate report	10d	$6,819	$1,819	24	$0	$0	$5,000	
2.5	Deliverable: Test report after installing 2 additional DPF's	1d	$0	$0	0	$0	$0	$0	
2.6	Conduct 1500 hour field trial (100 days estimated)	100d	$0	$0	0	$0	$0	$0	
2.7	Test locomotive emissions per Part 92 and inspect DPF systems	5d	$33,062	$6,062	80	$0	$6,000	$21,000	2 engineers (Electrical & Mechanical)
2.8	Analyze test data and generate report	10d	$6,819	$1,819	24	$0	$0	$5,000	
2.9	Deliverable: Phase 2 Summary Report	1d	$0	$0	0	$0	$0	$0	
2.10	Return locomotive to original condition	5d	$69,031	$3,031	40	$0	$6,000	$60,000	
	Project Management		$37,890	$37,890	500	$0	$0	$0	Includes status meetings and weekly remote data monitoring
	Field Support		$14,094	$9,094	120	$0	$0	$5,000	20 Hours per month during field trial
	Customer Training		$11,062	$6,062	80	$0	$5,000	$0	

Total Labor Rate	**$76**
Labo OH	32%
G&A OH	36%
Hourly Rate	$45

CRT Cost		
Substrates	$15,000	
Housing	$10,000	
Insulation	$5,000	
Expansion joint	$1,000	
Instrumentation, controls, data acquistion	$10,000	Only 1 needed for 3 systems
Total - Unit #1	$41,000	
Total - Unit # 1 with Materials Overhead	$43,517	
Total - Unit #2 & #3	$62,000	
Total - Unit #2 & #4 with Materials Overhead	$65,807	

Union Pacific Railroad Cost Estimate

#	Task	Duration	Total Cost
	AB118 Project – EPA Tier 4 Retrofit System	407d	$32,400
Task 1	Out of Service: SWRI testing	6 weeks	$10,800
Task 2	Out of Service: SWRI testing	6 weeks	$10,800
Task 3	Out of Service: SWRI testing	6 weeks	$10,800
Task 4	Out of Service Maintenance/repair over term of project. Assume 15%	5 weeks	$9,000
	Total In-kind Cost for UPRR:		**$41,400**

18 weeks out-of-service time for an ICTF genset as follows

Task 1 2 weeks for UPRR to move the locomotive from ICTF to San Antonio SwRI shop
2 weeks at the shop to install DPF on first genset
2 weeks for UPRR to move the locomotive back to ICTF
1500 hours of use

Task 2 2 weeks for UPRR to move the locomotive from ICTF to San Antonio SwRI shop
2 weeks at the shop to install DPF on 2nd and 3rd gensets
2 weeks for UPRR to move the locomotive back to ICTF
1500 hours of use

Task 3 2 weeks for UPRR to move the locomotive from ICTF to San Antonio SwRI shop
2 weeks at the shop to remove the DPF's at conclusion of the test
2 weeks for UPRR to move the locomotive back to ICTF

Task 4 Out of Service due to repair/maintenace to emissions control system 5 weeks $9,000

Cost 18 weeks at 6 days average usage per week and $300 days/day (to obtain substitute switchers to perform genset locomotive's job while off property)

Total In-kind Cost for UPRR: $41,400

D. Confidential Information

There is no confidential information in this response to the ARB solicitation.

E. Letters of Commitment/Support

Cummins
Johnson Matthey, Inc.
Union Pacific Railroad

California Air Resources Board
1001 I Street
Sacramento, CA 95812

Columbus, IN 4.30.2010

Johnson Matthey Diesel Particulate Filter System

Dear Sir or Madam,

Cummins Inc. is aware of Johnson Matthey's plan to apply for funding under AB 118 to test their locomotive diesel particulate filter system (CRT) on a genset switch locomotive powered by Cummins QSK19 engines. Cummins offers its endorsement of Johnson Matthey's effort to emissionize locomotives powered by Cummins engines to meet Tier IV emissions limits for NO_x and PM.

Johnson Matthey is currently testing their locomotive CRT device on an NRE switch locomotive at SWRI. We agree that continued field demonstration work would help bring this promising technology to full verification and the market place faster.

Johnson Matthey has been an important catalyst technology partner to Cummins for many years. Johnson Matthey catalysts and DPF filters are installed on Cummins engines for on-road, non-road vehicles and industrial applications. They also design retrofit DPF and catalyst systems for large high horsepower engines used in the power industry.

We know that Johnson Matthey's approach to emissions control technology development is thorough and methodical. Cummins is confident Johnson Matthey will succeed in developing cost effective locomotive emissions control systems.

If you have questions, please do not hesitate to contact me.

Sincerely
Glen Rees

Glen Rees
Cummins Inc.
Business Manager – N.A Rail

JOHNSON MATTHEY INC.
400 LAPP ROAD SUITE 200 MALVERN PA 19355-1212
T +1 484 320 2136 F +1 484 320 2152

Johnson Matthey
Catalysts

May 24, 2010

Ms. Johanna Levine
California Air Resources Board
Mobile Source Control Division
1001 'I' Street, P.O. Box 2815
Sacramento, CA 95812

RE: AQIP- Advanced Locomotive Aftertreatment Technology Demonstration Project

Dear Ms. Levine,

Johnson Matthey, Inc, an advanced materials technology company, is pleased to demonstrate our Diesel Particulate Filter (DPF) technology on a Union Pacific Railroad genset locomotive operating in rail yard facilities at both the Port of Los Angeles and the Port of Long Beach.

Johnson Matthey has been involved with the retrofit of diesel vehicles for more than 20 years on a worldwide basis. We have provided over 170,000 diesel retrofit systems worldwide with more than 50,000 of these systems in the United States. We have worked with the EPA, CARB, state and local governments as well as with industry to develop and provide advanced technology solutions to reduce emissions from both mobile and stationary sources. We have a proven commercialization process in bringing new products to market through a diversified network of distributors and dealers. It is anticipated that Johnson Matthey will commercialize their switch locomotive DPF technology within the next few years.

We believe the close collaboration and technical support we will receive from Union Pacific Railroad on this project will greatly assist us and the ARB in expanding the practical knowledge needed to ultimately obtain verification for the Johnson Matthey system. In addition, this project will enable the rail industry to provide a cost-effective solution to reduce PM emissions at the identified port rail yard facilities. As the Technology Demonstrator, Johnson Matthey will provide the required 50% in matching funds for this project upon award. We are confident of technical success in mitigating the growing problem of PM emissions at the ports.

With its partners, Johnson Matthey looks forward to potentially working with ARB through this AQIP grant program to initiate this important environmental improvement project.

If you have any questions please contact:

Steve Clark
Sales Manger, OEM Markets
Johnson Matthey, Inc
Phone: 480.320.2120
Email: clarksd@jmusa.com

Sincerely,

Jeff Sherman
Business Manager
Stationary Emissions Control
Johnson Matthey
Environmental Technologies
400 Lapp Rd, Suite 200
Malvern, PA 19355
(484) 320 2117 Office

UNION PACIFIC RAILROAD
1400 Douglas Street, STOP 1030
Omaha, Nebraska 68179-1030

P 402 544 2262
F 402 233 3083
C 402 306 7986
laschmid@up.com

Lanny A. Schmid Director Environmental Operations

May 27, 2010

Johanna Levine
Air Resources Board -Mobile Source Control Division
1001 'I' Street, P.O. Box 2815
Sacramento, CA 95812

Dear Ms. Levine;

The Union Pacific Railroad (UPRR) is pleased to support Johnson Matthey, the Port of Los Angeles, and the Port of Long Beach in their efforts to reduce air emissions in and around the ports' Dolores Yard and Intermodal Container Transfer Facility. As a project partner, UPRR will offer technical, in-kind and potential financial support to demonstrate Johnson Matthey's diesel particulate filter (DPF) aftertreatment technology on UPRR's three-engine Ultra Low Emitting Switch Locomotive under the California Air Resource Board's Air Quality Improvement Program.

UPRR and Johnson Matthey are currently working on a separate project involving a DPF technology on an identical NRE genset locomotive at the Southwest Research Institute in San Antonio, Texas. UPRR upholds Johnson Matthey's prior experience, in bringing new and reliable emissions control technologies to market, will enable the ports to demonstrate the DPF technology for their rail applications.

We believe that the proposed project will greatly assist in expanding the practical knowledge necessary to gain DPF product verification, which will supply the rail industry with a cost effective option to reduce PM emissions at rail yards at the ports, in the state of California, as well as nationwide.

Sincerely,

(signed)

Lanny A. Schmid

Director – Environmental Operations

F. Qualifications of Key Staff

Christopher Patton – Environmental Affairs Officer, Port of Los Angeles

- **Responsibilities**: Senior manager responsible for all air quality related environmental functions at the Port of Los Angeles
- **Education**: MA Environmental Design
- **Experience**: 17 years

Kevin Maggay – Air Quality Supervisor, Port of Los Angeles

- **Responsibilities**: Managing, developing, and implementing air quality improvement programs regarding cargo movement
- **Education**: BA Environmental Studies
- **Experience**: 10 years total

Rick Paczewski – Engineering Manager, Johnson Matthey

- **Responsibilities**: Management of product design and product support activities
- **Education**: BS Chemical Engineering, MBA-Finance
- **Experience**: 33 years total

Saji Pillai – Senior Project Engineer, Johnson Matthey

- **Responsibilities**: Mechanical design of emission control system. Responsibilities include product commissioning, troubleshooting and repair, data analysis.
- **Education**: BS and MS Mechanical Engineering
- **Experience**: 10 years

Kevin Carre – Senior Project Engineer, Johnson Matthey

- **Responsibilities**: Design of controls, including instrumentation and electrical hardware, software, and data acquisition and reporting system. Responsibilities include product commissioning, troubleshooting and repair, data analysis.
- **Education**: BS Electrical Engineering Technology
- **Experience**: 10 years

Jason deVillers – Field Service Engineer, Johnson Matthey

- **Responsibilities**: Product support, including troubleshooting and repair, commissioning, training, preventive maintenance, and field testing
- **Education**: Certified Electrician
- **Experience**: 9 years

Wassim Klink – Technical Program Manager, Johnson Matthey

- **Responsibilities**: Catalyst selection & sizing of the emissions control system. Modeling of system performance & regeneration. Input to the test plan and data analysis.
- **Education**: MS Systems Engineering; BS. Chemical Engineering
- **Experience**: 11 years with Johnson Matthey. Significant experience in diesel exhaust aftertreatment applications.

Lanny Schmid– Director Environmental Operations, Union Pacific Railroad

- **Responsibilities**: System-wide locomotive and facilities emissions issues. Coordinate Union Pacific Railroad's roles and duties as a Project Partner
- **Education**: MS Environmental Engineering; BS. Civil Engineering

- **Experience**: : 37 years in industrial environmental engineering issues; 25 at UPRR

Steven Fritz – Manager, Medium Speed Diesel Engines, Department of Emissions Research & Development, Southwest Research Institute

- **Responsibilities**: Test locomotive emissions at SWRI, a certified third party test facility
- **Education**: BS and MS in Mechanical Engineering
- **Experience**: 24 years

Christopher L. Patton
425 S. Palos Verdes Street
San Pedro, CA 90731
310.732.3677
cpatton@portla.org

Work History

CITY OF LOS ANGELES – HARBOR DEPARTMENT, ENVIRONMENTAL MANAGEMENT DIVISION
Environmental Affairs Officer *January 2007-Present*

Senior manager responsible for all air quality related environmental functions at the Port of Los Angeles. Manage staff of one Marine Environmental Supervisor and six Environmental Specialists, plus multiple consultants, in all aspects of policy and program development and implementation. Project manager for implementation of San Pedro Bay Ports Clean Air Action Plan, a landmark plan to reduce Port-related emissions by 40-50% over five years. Responsible for emission inventories, ambient air monitoring, risk assessments, technology development, special studies, legislative and regulatory analysis, and environmental analyses for CEQA/NEPA. Position requires successful interaction with and presentation to elected officials, including Mayor's office and commissioners; regulatory agencies; industry; community interests; and environmental organizations.

CITY OF LOS ANGELES - ENVIRONMENTAL AFFAIRS DEPARTMENT (EAD), AIR QUALITY DIVISION
Environmental Supervisor II *April 2005-December 2006*

Managed staff and consultants responsible for review and analysis of air quality related policies, legislation and regulations pertaining to mobile sources. Represented City on South Coast Air Quality Management District's 2007 Air Quality Management Plan Advisory Group. Provided policy and technical support to Mayor's Office related to state and regional goods movement initiatives (e.g., Statewide Goods Movement Action Plan and Emission Reduction Plan, San Pedro Bay Clean Air Action Plan). Assisted City fleet managers in assessment and demonstration of clean vehicle technologies in compliance with City's Clean Fuel Policy, including securing grant funding assistance for implementation. Managed staff conducting technical analyses of and making recommendations on air quality sections of City environmental assessment documents. Project manager for air monitoring/health studies assessment and development of action plan to reduce environmental burden in Sun Valley Environmental Justice Improvement Area, including public outreach and education. Managed staff and consultants responsible for update and revision of City's Energy Climate Action Plan.

CITY OF LOS ANGELES – HARBOR DEPARTMENT, ENVIRONMENTAL MANAGEMENT DIVISION
Environmental Specialist III *August 2002-March 2005*

Technical project manager for Port of Los Angeles No Net Increase (NNI) Plan, Port-wide Baseline Air Emissions Inventory (BAEI), Port-wide Air Quality Monitoring Program and Voluntary Commercial Cargo Vessel Speed Reduction Program. As technical lead to NNI Task Force, developed plan to reduce emissions from Port sources to 2001 levels, using cleaner engines, cleaner fuels, retrofit technologies and operational improvements. As project manager for BAEI, coordinated with shipping lines; terminal operators; harbor craft, rail and trucking operators; regulatory agencies; and consultants to develop comprehensive activity-based emissions inventory. Acted as staff liaison to Port Community Advisory Committee (PCAC) Air Quality Subcommittee. Prepared $60 million package of near-term air quality mitigation measures for implementation over FY 2005-2008. Provided technical analysis and support of air quality sections of environmental assessments. Represented Port on California Air Resources Board Maritime Working Group. Performed technical analysis of and prepare recommendations on proposed regulatory initiatives.

CITY OF LOS ANGELES - ENVIRONMENTAL AFFAIRS DEPARTMENT, AIR QUALITY DIVISION
Environmental Specialist III *July 2001-August 2002*

Responsible for the review and analysis of air quality related policies, legislation, and regulations pertaining to both mobile and stationary sources. Identified implications of federal, state and regional air quality and transportation planning initiatives to City operations; provide interagency and interdepartmental coordination and consultation; and formulated policies and strategies for recommendation to the Mayor and City Council, including preparation of briefing materials, technical memoranda, and comment letters. Technical lead for the City's Mobile Source Emission Reduction Trust Fund, including recommending, funding and reporting on projects. Represented the City on several policy and technical working groups at the South Coast Air Quality Management District and Southern California Association of Governments. Lead for City's Interdepartmental Alternative Fuels Task Force.

CHRISTOPHER L. PATTON & ASSOCIATES - Pasadena, CA *May 1999-June 2001*

Provided regulatory and legislative technical support to the City's EAD in the areas of air quality and air quality implications of transportation planning. Assisted staff in extensive technical review of the Los Angeles World Airports Master Plan and Draft EIS/EIR. Acted as project manager for the development of the City of Los Angeles Energy Climate Action Plan, adopted by the Los Angeles City Council in March 2001, and the City of Los Angeles Environmental Monitoring Project. Worked in conjunction with Environ International and Lawrence Berkeley National Laboratory to assist in evaluating and quantifying the air quality benefits of implementing urban heat island mitigation strategies in the region, including development of options for a State Implementation Plan (SIP) emissions credit generation mechanism.

JONES & STOKES ASSOCIATES - Sacramento, CA
Environmental Specialist IV *November 1996-May 1999*

Project manager and regulatory specialist on projects associated with wetlands, water resources, and flood control. Responsible for all aspects of project planning and environmental compliance, pursuant to federal Clean Water Act and state water quality requirements. Developed regulatory strategies, provided liaison between clients and regulatory agencies, prepared permit applications and other compliance documents, and managed mitigation plan design and implementation. Significant projects included: Sacramento Regional County Sanitation District Bufferlands Mitigation Bank, Castle Air Force Base Reuse Plan–Federal Bureau of Prisons, Edwards Air Force Base Rogers Lake Regulatory Compliance Plan, Teichert Lincoln Aggregate Facility, Sacramento and San Joaquin River Basins Comprehensive Study, and Ulatis Creekwalk Restoration Project.

CHRISTOPHER L. PATTON & ASSOCIATES - Pasadena, CA *April 1993-October 1996*

Great Basin Unified Air Pollution Control District. Prepared Draft and Final Mono Basin Planning Area PM10 SIP. Acted as lead author and editor, providing technical writing and environmental consultancy services. Assisted District with development of Owens Valley Planning Area PM10 Attainment SIP and EIR. Particular emphasis on integration of technical/scientific information with regulatory/procedural requirements to define and evaluate project alternatives, assess impacts, and identify mitigation.

CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA
College of Environmental Design–Graduate Research Assistant *October 1991-March 1993*

ELECTRONIC DATA SYSTEMS - San Diego, CA
Senior Account Executive *February 1990-September 1991*

CENFED BANK - Pasadena, CA
Manager of Banking Operations, Senior Vice President *April 1988-January 1990*
MIS Manager, Vice President *September 1983-April 1988*

COAST FEDERAL BANK - Los Angeles, CA
Business and Product Development *February 1978-September 1983*
Project Supervisor

Education

CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

Master of Arts, 1994 College of Environmental Design

American Society of Landscape Architects Planning and Urban Design Merit Award for Graduate Project entitled
Shaping the Future of Owens Lake, 1995
Outstanding Graduate Student Award, 1994
American Society of Landscape Architects Honor Award for Excellence in the Study of Landscape Architecture, 1994

COLORADO COLLEGE Colorado Springs, CO

Bachelor of Arts, 1975 Political Science
Phi Beta Kappa Magna Cum Laude

Kevin Maggay

425 S. Palos Verdes Street
San Pedro, CA 90731
(310) 732-3947
kmaggay@portla.org

EDUCATION

University of Southern California, Los Angeles, California,
B.A. Environmental Studies with an emphasis in Business, 1999

WORK EXPERIENCE

CITY OF LOS ANGELES, HARBOR DEPARTMENT MAY 2005-present
ENVIRONMENTAL SPECIALIST

Responsibilities include managing, developing, and implementing air quality improvement programs regarding cargo movement. Programs focus on port-related aspects of the logistics chain including heavy-duty trucks, cargo handling equipment, rail, and ocean going vessels and are in support of the San Pedro Bay Ports Clean Air Action Plan (CAAP). Additional responsibilities include coordinating with regulatory agencies and managing consultants.

Relevant Project Experience:

Technology Advancement Program (TAP)

- Port Program Manager of the TAP which evaluates and demonstrates new and emerging technologies.

Heavy-Duty Trucks

- **Clean Truck Program.** Participate in development and implementation of a port truck program that would reduce air emissions by 80% by replacing trucks or retrofitting trucks with diesel emission control technologies.
- **Gateway Cities Program.** Port Project Manager for the Gateway Cities Fleet Modernization Program, which provides incentive funding towards the purchase of a newer model year truck to individuals turning in an older model year truck. The program is currently conducting a demonstration project for diesel emission control technologies.
- **Liquefied Natural Gas (LNG) Truck Program.** Project Manager for program that provides incentive funding towards the purchase of LNG-powered trucks to truck fleets turning in older model year diesel-powered trucks.

Other Projects

- **Vessel Speed Reduction Program.**
- **Alternative Maritime Power Program.**
- **Locomotive Fleet Modernization Program.**
- **Yard Tractor Fleet Modernization Program.**
- **LNG Infrastructure Project.**
- **Hybrid Yard Tractor Project.**

CIRCLEPOINT, MAY 2004-MAY 2005

ENVIRONMANTAL PLANNER

Responsibilities include project management, preparation of various environmental reports in accordance with CEQA and NEPA mandates, field research, site analysis, budget preparation.

Relevant Project Experience:

Environmental Impact Statement (EIS)

Tongue River Railroad – Prepared several sections of EIS for construction of third and final phase of a new rail line extending from the Cities of Ashland to Decker, Montana, running adjacent to the Tongue River.

Response to Comments

- **Bay Area Rapid Transit (BART) to San Jose Extension Project.** Prepared Response to Comments to Draft Environmental Impact Report (EIR)/EIS for commuter rail extension from the Cities of Fremont to San Jose, CA.
- **Santa Cruz Recreational Rail Project.** Prepared Response to Comments to Draft EIR for a recreational rail project on an existing freight line in Santa Cruz County, CA.

Visual Impact Assessment (VIA)

- **Doyle Drive Improvement Project.** Prepared VIA, consistent with Federal Highway Administration methodology, for a roadway improvement project in San Francisco, CA.
- **Caldecott Tunnel Improvement Project.** Prepared VIA for addition of fourth bore in the Caldecott Tunnel in the Cities of Oakland and Orinda, CA.
- **101 Highway High Occupancy Vehicle Widening Project.** Prepared VIA for north and south bound portions of an.HOV lane project in Sonoma County, CA.
- **Alameda County Transit Bus Rapid Transit (BRT) Project.** Prepared VIA for BRT project from Berkeley to San Leandro, CA.

Other Reports

- Castro Valley Boulevard/Interstate 580 Interchange Project Community Impact Assessment and Relocation Impact Statement.
- Firs Street and Livermore Street Improvement Project Preliminary Environmental Study.

TERRY A. HAYES ASSOCIATES LLC, AUGUST 2001-MAY 2004
ENVIRONMENTAL PLANNER

Responsibilities include project management, preparation of various environmental reports in accordance with CEQA and NEPA mandates, field research, site analysis, air quality and noise modeling analysis and budget preparation.

Relevant Project Experience:

Environmental Management

Alameda Corridor-East (ACE) Construction Authority – Serving as Environmental Manager providing environmental assistance in accordance with CEQA and NEPA for a series of railroad grade separations and railroad safety improvements in the San Gabriel Valley. Responsibilities include coordination with government agencies, mitigation monitoring, environmental documentation, participation in community outreach workshops, contract specifications review, subcontractor management, and yearly budget monitoring and preparation.

Initial Studies/Environmental Assessments (IS/EAs)

- **Ramona Street Grade Separation Project.** Prepared IS/EA and obtained Notice of Determination (NOD) and Finding of No Significant Impact (FONSI) for a grade separation of the Union Pacific Railroad and Ramona Street for the ACE project.
- **Baldwin Avenue Grade Separation Project.** Prepared IS/EA and obtained NOD and FONSI for a grade separation of the Union Pacific Railroad and Baldwin Avenue for the ACE project.
- **San Gabriel Trench Project.** Prepared IS/EA for a railroad trench project at Mission Drive, Ramona Street, Del Mar Avenue and San Gabriel Avenue for the ACE project. NOD and FONSI approvals pending.
- **York Boulevard Bridge Rehabilitation Project.** Prepared IS/EA of a historic bridge rehabilitation project for City of Los Angeles Bureau of Engineering. Project currently on hold.
- **Avenues 26, 43 and 60 Bridge Rehabilitation Projects.** Began preparation of IS/EA of historic bridge rehabilitation projects for the City of Los Angeles Bureau of Engineering. Projects currently on hold.

Environmental Impact Reports (EIRs)

- **Monrovia Nursery Specific Plan EIR.** Prepared several sections of the EIR proposing to develop 489 acres of nursery land to residential and commercial uses including air quality and alternatives analysis sections.
- **Foothill Center Specific Plan and Redevelopment Project EIR.** Prepared alternative analysis section for proposed mixed-use development.
- **Central Industrial Redevelopment Project EIR.** Prepared public services, utilities and population and housing sections of the EIR for the redevelopment of a 744-acre redevelopment project in the City of Los Angeles.
- **City Center Redevelopment Project EIR.** Prepared public services, recreation and utilities sections of the EIR for an 879-acre redevelopment project in the City of Los Angeles.
- **Pacific Corridor Redevelopment Project EIR.** Prepared public services, recreation and utilities sections of the EIR for a 694-acre redevelopment project in the San Pedro area of the City of Los Angeles.
- **Glendale Embassy Suites Hotel EIR.** Prepared EIR for a 277-room, 190,000-square-foot hotel located within the City of Glendale.
- **Big Bear Lake Hilton Garden Inn EIR.** Prepared cumulative impacts and alternatives sections for a 91-room hotel project in the City of Big Bear, CA.

Air Quality and Noise Impact Analyses

- **Maddock Nursery Soil Source.** Prepared Noise Impact Analysis for landfill closure soil source in Fallbrook, CA.
- **Calexico Walmart.** Prepared Noise Impact Analysis for construction and operation of a WalMart Project in the City of Calexico, CA.
- **El Centro WalMart.** Prepared Noise Impact Analysis for construction and operation of a WalMart Project in the El Centro, CA.
- **San Manuel Indian Reservation Casino.** Prepared Noise Impact Analysis for construction and operation of a casino expansion located on the San Manuel Indian Reservation, CA.
- **Hollywood Watt Housing Development Air Quality and Noise.** Prepared Air Quality and Noise Impact Analysis for a housing development located in Inglewood, CA.
- **La Tijera Boulevard Bridge Widening Project Air Quality and Study.** Prepared Air Quality Analysis for a bridge widening project over the 405 freeway.

- **Los Angeles Air Force Base.** Prepared air quality models for the annexation of air force base land in El Segundo and Simi Valley, CA.

TRC, JUNE 2000-AUGUST 2001
PROJECT COORDINATOR

Responsibilities included preparation of environmental documentation, report editing, reproduction of reports, and traffic impact modeling analysis.

Relevant Project Experience:

Applications for Certification (AFCs)

- **CalPeak Power – Border, LLC.** Prepared AFC for 49.5 mega-watt peaker power plant in San Diego, CA pursuant to California Energy Commission (CEC) 21-day emergency permitting process.
- **CalPeak Power – Escondido, LLC.** Assisted in the preparation of AFC for a 49.5 mega-watt peaker power plant in Escondido, CA pursuant to CEC 21-day emergency permitting process.
- **Duke Energy Morro Bay Power Plant Modernization and Replacement Project.** Assisted in the preparation of AFC for a 1,200 mega-watt replacement facility located in Morro Bay, CA.

Environmental Impact Report (EIR)

- **Tajiguas Landfill Expansion.** Assisted in the preparation of an EIR of a landfill expansion project in Santa Barbara, CA.

Traffic Impact Analysis

- **Santa Ana Bus Base.** Created existing and future conditions traffic models for a bus base and maintenance facility on Santa Ana, CA.
- **St. Josephs Medical Center.** Created existing and future conditions traffic models for a medical center in Tustin, CA.

ADDITIONAL WORK EXPERIENCE

ENVIRODETICS, INC., AUGUST 2002-JULY 2003
ASSOCIATE

Independently contracted by Envirodetics, Inc. to conduct site investigations and research for Phase 1 Environmental Site Assessments and Property Conditions Assessments.

JOHN MINCH AND ASSOCIATES, APRIL 2001-JUNE 2001
PALEONTOLOGICAL MONITOR

Monitored construction sites for paleontological resources.

COMPUTER SKILLS

Modeling Programs: *AIR QUALITY:* Cal3QHC, URBEMIS, CALINE4.
NOISE: FHWA-RD-77-108, SOUND32, SOUND2000, BASICA.
TRAFFIC: TRAFFIX.

Programs: Word, Excel, PowerPoint, WordPerfect, Acrobat, Pagemaker, Corel Draw

Richard M. Paczewski
486 Herald Drive
Ambler, PA 19002
215-646-1618

Engineering, Production, Safety and Quality Manager with more than 33 years experience in chemical and capital equipment manufacturing industries. Background includes:

- Managing and directing engineering, quality, manufacturing, maintenance, safety, lab, pilot plant, and emergency response operations;
- Directing the development of quality, safety, and environmental management systems;
- Designing engine emissions control systems, gas purification equipment, and semiconductor fab equipment.
- Investigating, identifying, and resolving process and equipment problems;
- Developing and introducing standard operating procedures and training plans.

PROFESSIONAL EXPERIENCE

JOHNSON MATTHEY, Malvern, PA 5/01 to Present
Engineering Manager (11/05- present) – Manage a team of mechanical and electrical engineers with responsibility for the design, fabrication, installation, commissioning, and field support activities for emission control systems for stationary engines and locomotives.

Quality Manager (5/01-11/05) - Responsible for the management of product quality, product development, and product troubleshooting. Served as project manager for new product development teams that developed bulk gas purification systems. Developed an innovative hydrogen gas purifier that was awarded a US patent (US Patent #6866698). Reduced warranty return rate from 15% to 5% through the control of manufacturing processes and improvements in product design.

CFM TECHNOLOGIES, INC., West Chester, PA 5/93 to 5/01
Quality Manager (5/95 to 5/01) - Responsible for the management of product quality and the quality, environmental and safety management systems for the design, manufacturing, and servicing, of chemical process equipment for the semiconductor and flat panel display industries.

Created a corporate product quality assurance department staffed with QA engineers, internal auditors, mechanical inspectors, and a supplier quality manager. Successfully directed the development of formal quality and environmental management systems from inception through ISO 9001 and ISO 14001 certification. Created and led a safety committee, HazMat team, first-aid team, internal auditing team, and implementation teams for ISO 9001 and ISO 14001.

Senior Project Manager (5/93 to 5/95) - Responsible for the management of an ARPA development project for the design and manufacture of a specialized chemical process cleaning system for flat panel display manufacturing. Successfully installed and validated the new system within three months. Also acted as the Account Manager for the customer with responsibilities including sales, marketing, and customer support.

RHONE-POULENC AG COMPANY, Ambler, PA 7/84 to 5/93
Production Manager - Responsible for the production and shipment of five million pounds/year of liquid plant growth regulator. Also acted as the Director of Safety and Occupational Health and back-up Plant

Manager. Duties included directing all plant production operations, safety and health activities, production supervisors, quality control personnel, and union chemical operators.

- Developed production procedures which increased capacity 25% and saved $1 million.
- Developed standard operating procedures which improved product yield and saved $250,000.
- Served as the Incident Commander for an eight member corporate HazMat response team, that covered northeastern U.S. Successfully managed incidents in airport, railway, warehouse, and highway locations.

JOHNSON MATTHEY, West Deptford, NJ. 7/83 to 7/84
Production Supervisor - Supervised the production of platinum group chemical compounds and waste treatment operations. Duties included supervising chemical operators, production scheduling, process optimization and troubleshooting.

AMSTAR CORPORATION, Philadelphia, PA 8/80 to 9/82 (plant shutdown)
Production Engineer - Responsible for the production and shipment of one million lbs/day of liquid cane sugar. Duties included the management of shift supervisors and union personnel, production scheduling, process optimization and troubleshooting, cost and quality control, traffic coordination and safety. Reduced customer complaints 90% and reduced demurrage costs $50,000. Developed a sugar syrup reprocessing process that saved $200,000.

GULF & WESTERN INDUSTRIES, Gloucester City, NJ 9/77 to 8/80
Chemical Engineer - Supervised pilot plant operations and also responsible for troubleshooting plant operations for the production of 100 tons/day of titanium dioxide.

EDUCATION

MBA, Finance, La Salle University, 1990
B.S.E., Chemical Engineering, University of Pennsylvania, 1977

JM

Johnson Matthey
Catalysts

Saji R Pillai,
Senior Project Engineer,
Johnson Matthey Inc.
Stationary Emissions Control
Malvern, PA
Tel: 484 919 0650

Dated May 25, 2010

More than 20 years experience in detail engineering design, development, testing and troubleshooting high precision mechanical engineering components.

Years with Johnson Matthey – 3 ½ years

Current Responsibilities:
Involved in all aspects of detail engineering design, development, project execution and technical support of both standard and turn key emission control systems for the Stationary Source Emissions Control business unit of Johnson Matthey Inc

Professional Background:
EDUCATION

- MS in Mechanical Engineering and Mechanics, Drexel University, PA, 2005
- Fellowship in Gas Turbine Technology, IAT, INDIA, 1990
- BS, Mechanical Engineering, Dayalbagh Engineering College, INDIA, 1989

SKILLS:
Six Sigma Green Belt, Certified in Design For Six Sigma (DFSS), COSMOSM FE Analysis, ANSYS FLUENT CFD Software, AUTOCAD 2010, MathCAD, Mathlab including SIMULINK, Project Management & Microsoft Project. Manufacturing and Producibility review Board experience, Failure mode analysis (FMEA), Detail engineering analysis and design.

Patents: US patent # 20090322031 –Windback Device – Stein Seal Company.

Previous positions held:
Company: Stein Seal Company.
Address: 1500 Industrial Blvd, Kulpsville, PA 19443
Title: Project engineer, 1998 -2006
Responsibilities:
Completely responsible for the detail engineering design, development, testing and troubleshooting of high precision aircraft engine sealing components. Designed, developed and improved Bearing Chamber seals for the following commercial and military aircraft engines – F136, F119, F404, CF-34, GE-90, GEnx, CFM56, Trent -500 etc.

Company: Gas Turbine Research Establishment, Government of India.
Address: CV Raman Nagar, Bangalore, India
Title: Scientist, 1991 -1997
Responsibilities:
Completely responsible for the detail engineering design, development, testing and troubleshooting high precision aircraft engine components like shafts, bearings, housings etc.

Kevin P. Carre'
239 Baxter Drive
Phoenixville, PA 19460
484-924-8020
kevincarre@verizon.net

EDUCATION:

College of Engineering and Applied Science, Lehigh University, Lehigh, PA
Masters of Science in Manufacturing Systems Engineering
Expected MSMSE Completion **August 2010**

College of Engineering, Temple University, Philadelphia, PA
Bachelor of Science in Electrical Engineering Technology **May 2000**

Marine Corps Communications Electronics School, 29 Palms, CA
Certification in RF Communication Equipment Repair **June 1988**

EXPERIENCE:

Johnson Matthey, Inc., Malvern, PA **August 2007 - Present**
(Emissions Control Technology)
Sr. Project Engineer

Manage turn-key customer projects for SCR systems for diesel and lean-burn natural gas engines. Design custom systems according to customer specifications, while ensuring supplier quality through the fabrication process to the final installation and commissioning of the system.

Remote CRT control and data-logging system developed for locomotive CRT. New lower cost SCR control system developed for the stationary and locomotive applications. New inspection and testing procedures were adopted to identify fabrication defects from the vendor, and ensure customer quality. Provide customer support for field service projects and SCR control systems.

Merck & Co., West Point, PA **August 2003 – August 2006**
(Pharmaceutical Manufacturing)
Manufacturing Engineering Supervisor

Supervise and facilitate maintenance work for cGMP filling, particle inspection and lyophilization manufacturing equipment of various cell-cultured LVV and alum-based vaccines. Provide technical support for manufacturing, maintenance and utility departments in Vaccine Sterile Operations. Conducted investigations for atypical process events to determine root cause and implement corrective actions. Analyze process-derived data to support troubleshooting and optimization of process improvements.

JASON DE VILLIERS

Email: villijj@jmusa.com
104 S. Hayworth Ave. #203
Los Angeles, CA 90048
(213) 453 6822

EDUCATION

May 1993	Port Shepstone Technical College, Port Shepstone, KZN South Africa N4 Electrical Trade Theory: N4 Electronics.
December 1998	Qualified Accredited Journeyman Electrician (Graduated with Honors)
November 2005	C-10 Electrical California State Contractors License

SKILLS

Excellent Public Relations; Analytical; "Out of Box" Thinker; Experience, Skill and Practice with National Electrical Code and Contractors Business Law Blue Prints, Alarm Systems, Generator Maintenance and Installation, UPS Systems, Grounding, Conduit Installation, Wiring, Panel Board Installation, Lighting and Controls, Transformers, Motors and Motor Starters, Variable Speed Drives, PLC's and Control Systems; Proficient in MS Office; Project; GroupWise; Concur; Adobe Acrobat; Fluent in Afrikaans; Conversational Spanish: Conversational Korean.

EXPERIENCE: Ten-years experience (information and recommendations are available upon request)

July 2005 to Present — **JOHNSON MATTHEY INC.**
Field service Technician SSEC Environmental Catalysts.
California Field office. (Home Office)

- Monitor and maintain field trails with various experimental catalysts. Including data download and operator training.
- Gained extensive knowledge of catalyst fundamentals. Namely, manufacture process, cost of product, ideal operating parameters, principal of catalytic reaction, maintenance and reasons for failure. Namely, poisoning, masking or over temping the catalyst leading to thermal sintering.
- Offer emergency and scheduled maintenance support to all stationary customers on the West coast.
- Assist with field service support to HDD division as needed. This has entailed data downloading, installation and troubleshooting.
- New installations start up support. Including set up, documentation of all custom parameters, operator training and detailed reporting to peers once complete.
- Site evaluation for new or potential orders including engine details and measurement of available space for design purposes.
- California dealer training and support for SCR, CRT and CRTdm products.
- Compliance with all Johnson Matthey hazardous waste procedures and California laws.
- Maintain and operate company issued vehicle and equipment. Including inventory and spare parts in storage.
- Involvement with sales where technical field experience is required.

October 2004
to July 2005

PAUL NARDI ELECTRIC
LEAD ELECTRICIAN

- Generates innovative ideas, challenges the status quo, comfortable leading and directing a team to achieve results and through challenges, holds self and others accountable for ensuring that goals are achieved
- Prepares strategies, budgets and conclusions to use in judgmental procedures
- Builds skills and capabilities in self and others in all appropriate competency areas and applies up-to-date measures to ensure security and safety in hazardous working environments
- Communicates effectively and manages a number of responsibilities in the face of competing priorities
- Identifies and communicates potential weaknesses and recommends improvements to clients
- Supervises, trains and evaluates team and reviews work progression
- Completes projects with excellent quality of workmanship and compliance to electrical code
- Accountable for overall coordination and completion of electrical installations and repairs for commercial and residential properties

April 2002
to February 2004

FACILITY OPERATIONS PLUS
CHIEF BUILDING ENGINEER

- Prepared the Building and Life Fire Safety Manuals
- Obtained exposure and experience with high profile clients and up-to-date methods and technology
- Obtained a high level of interaction with diverse, talented, action-oriented professionals with high personal aspirations
- Exchanged ideas, logistics and resources for building events
- Planned and organized construction projects with close attention to detail and quality control
- Assisted in coordinating interviews for part and full-time employees

901 Parkview Dr Apt#A411
King of Prussia, Pa 19406

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E-mail
wassim_klink@hotmail.com

Wassim Klink

Education

December 1999 University of Houston Houston, TX
- Bachelor of Science in Chemical Engineering

December 2008 Penn State University Great Valley, PA
- Master of Science in System Engineering

Professional experience

February 2000 - Now Johnson Matthey Wayne, PA

Senior Application Engineer/ Technical Manager – March 2005 – Current
- Support Customer application programs which Includes the design and execution of technical programs aimed at the application of exhaust after-treatment technologies In Heavy Duty Diesel (HDD) vehicles
- Interact closely with team leader to design and carry out programs to investigate the application of catalyst technologies on HDD vehicles
- Analyze, interpret, and summarize data obtained during the execution of the programs, provide assistance in scheduling and troubleshooting during samples preparation and testing
- Support the effective technical communication between Johnson Matthey and customer exhaust after-treatment groups, by communicating data from the technical programs.
- Provide technical support and applications information to Johnson Matthey Sales, Marketing and Customer Service groups

Product Development Engineer – Nov 2001 – Feb 2005
- Headed the stationary Selective Catalytic Reduction (SCR) program responsible for the development and improvement of SCR catalyst for the power generation markets. The tasks includes design and execution of technical programs, interaction with samples preparation, aging, and testing personnel to ensure experiments are conducted correctly and in a resource effective manner
- Support technical communication between Johnson Matthey and SCR customer on product performance capabilities and resolving customer problem
- Assist in production transfer process and interface with manufacturing personnel to ensure new products are manufactured correctly
- Interact with process development and production to ensure that good quality SCR products are manufactured and ensure that proper actions are taking when problems arise

Production Engineer – Feb 2000 – Oct 2001
- Implement process and procedural improvements to meet plant productivity and quality goals
- Support implementation of new technology through new procedures and training personnel
- Suggest process and procedural improvements to meet plant productivity and quality goals
- Support implementation of new technology through new procedures and training personnel

STEVEN G. FRITZ, P.E.
Manager
Medium-Speed Diesel Engine Section
Department of Emissions Research and Development
Engine, Emissions and Vehicle Research Division

M.S., Mechanical Engineering, Michigan Technological University, 1986
B.S., Mechanical Engineering, Michigan Technological University, 1984

Mr. Fritz has led numerous projects involving characterizing both regulated and unregulated exhaust emissions from heavy-duty diesel engines covering 50 to 6,000 horsepower. He has published over 115 technical reports and peer-reviewed technical papers on the subject. Projects have included on-highway and nonroad engine applications, as well as locomotive, marine, and undergrounding mining.

As Manager of the Medium-Speed Diesel Engine Section, Mr. Fritz leads SwRI's activities in locomotive exhaust emissions characterization. He established the SwRI Locomotive Exhaust Emissions Test Center in 1992, and to date, over 200 locomotives have been tested. Mr. Fritz is a recognized expert in locomotive exhaust emission testing, and often serves as a consultant to industry and government on locomotive testing issues. In addition, he has managed several projects involving medium-speed diesel engines, and is responsible for activities in characterizing the gaseous and particulate emissions from medium-speed laboratory engines at SwRI.

PROFESSIONAL CHRONOLOGY: Michigan Technological University: undergraduate research assistant, 1983-4; graduate research assistant, 1984-6; Southwest Research Institute: 1986-[research engineer, 1986-91; senior research engineer, 1991-2000; principal engineer, 2000-5; manager, 2005-present].

MEMBERSHIPS: American Society of Mechanical Engineers (ASME) International
Locomotive Maintenance Officers Association (LMOA)

Nov, 2009