The Boeing Company
Santa Susana Field Laboratory
5800 Woolsey Canyon Road
Canoga Park, CA 91304-1148

Via E-mail

September 28, 2012
In reply, refer to SHEA 112457

Ms. Cassandra Owens
Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Subject: 2012 Best Management Practices (BMP) Plan Addendum, The Boeing Co, Santa Susana Field Laboratory, Canoga Park, CA (Order No. R4-2010-0090; NPDES No. CA0001309, CI No. 6027)

Dear Ms. Owens:

Per the requirements of The Boeing Company's (Boeing) National Pollutant Discharge Elimination System (NPDES) Permit (Order No. R4-2010-0090) adopted by the Regional Water Quality Control Board on June 3, 2010, Boeing is providing the enclosed 2012 Best Managements Practices (BMP) Plan Addendum to the October 2010 Santa Susana Site Outfalls 008/009 Watersheds BMP Plan. This document has been developed with the input of, and in accordance with recommendations from the Santa Susana Surface Water Expert Panel, and was prepared for Boeing and the National Aeronautics and Space Administration (NASA). The enclosed report will be posted on the Boeing external website at the following address: http://www.boeing.com/aboutus/environment/santa_susana/isra.html

If you have any questions or require any further information, please contact Debbie Taege at 818-466-8849.

Sincerely,

for

Thomas D. Gallacher
Director
Santa Susana Field Laboratory
Environment Health and Safety

TDG:jag

Enclosure: 2012 Best Management Practices (BMP) Plan Addendum

cc: Mr. Peter Raftery, RWQCB, e-mail
Mr. Mazhar Ali, RWQCG, e-mail
Mr. Buck King, DTSC
Mr. Allen Elliott, NASA
Mr. Peter Zorba, NASA
Dr. Michael Stenstrom, Surface Water Expert Panel
Mr. Jon Jones, Surface Water Expert Panel
Dr. Mike Josselyn, Surface Water Expert Panel
Mr. Randy Dean, CH2M Hill
Mr. Brandon Steets, Geosyntec
Ms. Bronwyn Kelly, MWH, e-copy only
Mr. Alexander Fischl, MWH, e-copy only

Prepared for

The Boeing Company and the National Aeronautics and Space Administration
Santa Susana Field Laboratory
5800 Woolsey Canyon Road
Canoga Park, CA 91304-1148

2012 BMP PLAN ADDENDUM

SANTA SUSANA SITE
VENTURA COUNTY, CALIFORNIA

Prepared by

Geosyntec consultants

engineers | scientists | innovators
3415 S. Sepulveda Blvd, Ste. 500
Los Angeles, CA 90034

and

The Santa Susana Site Surface Water Expert Panel

September 28, 2012

TABLE OF CONTENTS

1. INTRODUCTION 1

1.1 PROJECT BACKGROUND 3
1.2 SUMMARY OF EXPERT PANEL'S BMP RECOMMENDATIONS 5

2. BMP RECOMMENDATIONS 5

2.1 ELV/CM-1 (NASA) 6
2.1.1 Drainage Area Description 6
2.1.2 BMP Description 7
2.2 24-INCH DRAIN BENEATH LOWER PARKING LOT (BOEING) 8
2.2.1 Drainage Area Description 8
2.2.2 BMP Description 9
2.3 B-1 AREA (BOEING) 10
2.3.1 Drainage Area Description 10
2.3.2 BMP Description 10
2.4 CM-9 ROAD RUNOFF (BOEING) 11
2.4.1 Drainage Area Description 11
2.4.2 BMP Description 11
2.4.3 Project Summary 12

3. SCHEDULE 12

5. REFERENCES 14

LIST OF APPENDICES

Appendix A: Stormwater BMP Concept Designs for the Santa Susana Site, Watershed 009, NASA and Boeing Properties

ABBREVIATIONS AND ACRONYMS

A1LF	Area 1 Landfill
ACOE	Army Corps of Engineers
BMP	Best Management Practice
Boeing	The Boeing Company
CDFG	California Department of Fish and Game
CM	culvert modification
CMP	corregated metal pipe
COC	constituent of concern
DNQ	data not qualified
DTSC	Department of Toxic Substances Control
ELV	Expendable Launch Vehicle
Expert Panel	Santa Susana Site Surface Water Expert Panel
Geosyntec	Geosyntec Consultants
HDPE	high-density polyethylene
ISRA	Interim Source Removal Action
LOX	liquid oxygen
MWH	MWH Americas, Inc.
NASA	National Aeronautics and Space Administration
NEL	Numeric effluent limit
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RMMP	Restoration, Mitigation, and Monitoring Plan
RTL	Radiological Trigger Level
RWQCB	Los Angeles Regional Water Quality Control Board
SAP	sampling and analysis plan
SCE	Southern California Edison
TCDD	tetrachlorobenzo-p-dioxin
TEQ	toxic equivalency
TSS	total suspended solids
USDA	United States Department of Agriculture

1. INTRODUCTION

The document herein describes the conceptual designs for Best Management Practices (BMPs) that were identified based on procedures described in the BMP Plan (MWH et al., 2010a) and an evaluation of potential BMP subarea monitoring data from the 2011/2012 rainy season within the Outfalls 008 and 009 watersheds at the Santa Susana Site, Ventura County, California. The BMP Plan was implemented with oversight and participation of the Los Angeles Regional Water Quality Control Board (RWQCB) with the objective of meeting the numeric effluent limits (NELs) for Outfalls 008 and 009 established in the National Pollutant Discharge Elimination System (NPDES) Permit (Order R4-2010-0090) adopted by the RWQCB on June 3, 2010 (RWQCB, 2010). Potential BMP subarea monitoring activities were conducted by MWH Americas, Inc. (MWH) on behalf of The Boeing Company (Boeing) and the National Aeronautics and Space Administration (NASA) according to the 2011/2012 BMP and Interim Source Removal Action (ISRA) Performance Monitoring Sampling and Analysis Plan (SAP) (MWH, 2011).

The following Best Management Practices (BMPs) recommendations have been developed by the Santa Susana Site Surface Water Expert Panel (Expert Panel) based on review and evaluation of 2011/12 NPDES compliance and BMP subarea monitoring results, consideration of short-term Boeing and NASA watershed plans (e.g., for the Northern Drainage, ISRA, stormwater BMP, and demolition programs), and field reconnaissance. The Expert Panel, in collaboration with Geosyntec Consultants (Geosyntec), developed these recommendations into BMP concepts that will be considered by Boeing and NASA for implementation in 2013. Boeing and NASA will consider these recommendations and concepts, discuss them with the Expert Panel, and proceed with BMP activities in 2013 based on the outcome of these discussions, new data, available budget, easement constraints, engineering/constructability constraints, and other relevant factors.

The five related submittals preceding this BMP Plan Addendum are briefly summarized below.

- The October 2010 Santa Susana Site 008/009 BMP Plan (MWH et al., 2010) outlined the Expert Panel's general proposed approach for siting new BMPs in the Outfall 008 and 009 watersheds, including source, erosion, and treatment control BMPs, to improve stormwater quality and minimize future NPDES exceedances at these outfalls. This report also committed to submit a BMP Plan Addendum after the 2010/2011 rainy season that would describe the types and locations of BMPs to be implemented based on the evaluation of available data.

- The June 2011 Site Ranking Analysis Approach letter written to the RWQCB (Expert Panel and Geosyntec, 2011a) summarized the Expert Panel's general approach for ranking and selecting BMP implementation locations in the Outfall 008 and 009 watersheds. The letter described the final, most refined approach to prioritizing potential BMP sites, the factors upon which this approach was based, and the considerations that were taken into account while developing the approach. The BMP site ranking analysis identified several new prioritized sites which were evaluated and summarized in the July ISRA/BMP Annual Report (MWH et al., 2011).

- The September 2011 Santa Susana Site 008/009 BMP Plan Addendum (Geosyntec and the Expert Panel, 2011) outlined the Expert Panel's recommendations for siting new BMPs in the Outfall 009 watershed to improve stormwater quality and minimize future NPDES exceedances at the outfall. This plan included recommendations for BMPs at four areas including: Helipad, Expendable Launch Vehicle (ELV) area, Liquid Oxygen (LOX) area, and the Area I Landfill (AILF). During fall 2011, the sandbag berm and Geocell along the eastern portion of the LOX truck turn-around area were installed. The slope drains and riprap, which require permit approval to be installed, are included with the Northern Drainage Restoration, Mitigation, and Monitoring Plan (RMMP) permitting package and are under construction as of September 2012. The AILF conceptual design included a vegetated swale atop the hillside; however, as an equivalent alternative, approximately 1.5 acres of surrounding asphalt (Building 1324 parking lot) was removed and the remaining flat area was stabilized with wattles and hydroseed mulch. NASA had intended to implement BMPs at the ELV and the Helipad in the summer of 2012 but determined that it could not take action until Department of Toxic Substances Control (DTSC) approved use of the December 2011 EPA Radiological Trigger Levels (RTLs) for the soils. Approval was received in August 2012; however, NASA has indicated that construction will not likely be feasible before the start of the 2012/2013 rainy season. NASA was able to complete the recommended asphalt punching upstream of the temporary Helipad sand bag berms in September of 2012 to create infiltration holes in the ponding areas.

- The December 2011 BMP/ISRA SAP (MWH, 2011) outlined the approach for monitoring potential BMP subareas. The purpose of the memorandum was to provide stormwater runoff monitoring recommendations for evaluating where distributed treatment BMPs (both short- and long-term) may be needed in upstream

subareas of the Outfall 008 and 009 watersheds, as proposed in the October 2010 Santa Susana Site 008/009 BMP Plan. The memorandum described general guidance for sampling locations, analytes, frequency, and protocol.

- The August 2012 ISRA/BMP Annual Report (MWH et al., 2012) presented the Expert Panel's BMP siting analysis and final BMP recommendations, based on the results of the 2011/2012 rainy season monitoring, which are further developed herein. The August Annual Report generally found that the water quality in the Outfall 008 watershed was not a high priority in terms of its need for treatment and that BMP work previously scheduled to be constructed is currently expected to be sufficient; therefore, new BMPs are not required in Outfall 008 and are only recommended for the Outfall 009 watershed. This report included a detailed report prepared by Geosyntec and the Expert Panel (Geosyntec and the Expert Panel, 2012) that described the monitoring data analyses performed and the results of these statistical evaluations, which form the basis for the Expert Panel's new BMP recommendations.

The purpose of this BMP Plan Addendum is to present the new erosion and treatment control concepts that are recommended for the Outfall 009 watershed at the Santa Susana Site, as well as their corresponding implementation schedules.

1.1 Project Background

In late 2010, a BMP subarea monitoring program (MWH, 2010) was developed and implemented within the Outfall 008 and 009 watersheds at the Santa Susana Site, as stated in the BMP Plan (MWH et al., 2010). The BMP monitoring program was designed to assess the contribution of constituents of concern (COCs) from the source areas of stormwater runoff to identify subareas that were most in need of implementation of new or enhanced stormwater controls or BMPs to improve NPDES permit compliance. This program involved the collection of stormwater samples in proximity to "potential" BMP sites, defined as locations receiving runoff from likely source areas (e.g., ISRA areas, Resource Conservation and Recovery Act [RCRA] Facility Investigation [RFI] areas, or areas where historic industrial activities are known to have occurred) and other infrastructure (e.g., roads, buildings, parking areas). In

addition, runoff from "stormwater background" areas[1], or locations receiving runoff from unimpacted and undeveloped areas, within the Outfall 008 and 009 watersheds was sampled. During the 2011/2012 rainy season, stormwater runoff inspections and sampling was performed at 2 "potential" BMP sites in the Outfall 008 watershed, 16 "potential" BMP sites in the Outfall 009 watershed, and 5 locations identified to monitor stormwater runoff quality from natural undisturbed or "stormwater background" areas (MWH et al., 2011).

The Expert Panel's approach for identifying specific BMP subareas for new stormwater controls was to rank potential BMP subarea monitoring sites based on the results of comparisons between the following measured values and thresholds: (a) stormwater concentrations and NPDES permit limits, and (b) stormwater particulate strengths (i.e., constituent particulate mass per mass of total suspended solids (TSS), which normalizes the particulate-bound constituent concentration by the concentration of TSS in the sample to allow for an evaluation of the constituent "strength" of suspended particles) and particulate strengths measured at onsite stormwater background locations (Expert Panel and Geosyntec, 2011a). A statistical methodology was developed to rank the potential BMP monitoring sites based on these comparison results while accounting for the number of useable data available at each site as well as the number of data observations that fell above the thresholds (i.e., reflecting statistical confidence in how frequently each site will exceed the comparison thresholds). This methodology relied on weighting factors that were calculated for each NPDES COC category (specifically metals [including Cd, Cu, Hg, and Pb], dioxins [including 2,3,7,8-tetrachlorobenzo-p-dioxin {TCDD} and TCDD toxic equivalency factor {TEQ}], and TSS) for each site. In the end, the constituent-specific weighting factors were summed to produce a multi-constituent score (ranging from 0.0 [lowest relative exceedance of thresholds] to 1.0 [highest relative exceedance of thresholds]) to allow for relative ranking amongst the potential BMP sites, with the sites with the highest relative rankings recommended to be further evaluated for new stormwater controls based on site-specific considerations and best professional judgment.

In addition to the new proposed controls described in this document, several short-term BMP activities have either already been completed or are (as of September 2012) currently being constructed in Outfall 008 and 009 watersheds to improve surface water

[1] The site specific stormwater background dataset is for the assessment of stormwater only and is not considered part of the ongoing soil background sampling activities begin conducted under DTSC oversight.

quality, as outlined in the August 2012 Annual Report. Some of these activities include a sediment basin and biofilter at the lower parking lot soil stockpile area, northern drainage restoration activities, demolition of building 1436, helipad drainage holes punched through the asphalt upstream of the previously installed sandbag berms to enhance infiltration, dirt road rehabilitation and maintenance, erosion controls, reconstruction of the B-1 media filter, addition of filter fabric over the weir boards at the culvert modifications (CMs) to enhance CM performance, and ISRA soil excavations, all of which are further detailed in the August 2012 Annual Report (MWH et al., 2012).

1.2 Summary of Expert Panel's BMP Recommendations

Based on the potential BMP subarea monitoring site analysis results (Expert Panel and Geosyntec, 2011b), 11 of the 63 subareas evaluated were identified as top-ranked potential BMP locations, all of which were in Outfall 009. These 11 top-ranked sites were then selected for further evaluation based on site-specific considerations and best professional judgment, which accounted for future ISRA and infrastructure demolition plans, existing BMPs, and new BMP implementation constraints and feasibility. As a result of these assessments, the Expert Panel has selected four sites (encompassing several closely located subareas) for new BMP implementation as a first priority. The recommended BMPs are located on both Boeing and NASA property. The remaining sites will be monitored during the 2012/2013 rainy season, after which the need for stormwater controls will be re-evaluated.

The existing Santa Susana Site BMP sizing criterion developed by the Expert Panel is for the capture of runoff from the 1-year, 24-hour storm event, or alternatively 90% long-term runoff volume capture (these are roughly equivalent). This criterion was used for the preliminary sizing of new treatment controls for the BMP Plan, and will be reevaluated by the Expert Panel on a site-by-site basis as individual projects are developed. Upon further project development, site-specific considerations include, for example: constructability constraints (including available space); stormwater monitoring results; anticipated BMP functional lifetime; timeframe for infrastructural demolition and final remediation; anticipated nature of remediation in potential BMP location; capital and operation and maintenance costs; potential impacts caused by the construction of the BMPs themselves; and other information.

2. BMP RECOMMENDATIONS

Within the four sites where BMPs were chosen for implementation are six of the top seven highest ranked subareas, with multi-constituent scores ranging from 0.63 to 0.94

(see August 2012 ISRA/BMP Annual Report [MWH et al., 2012] for explanation). Besides their multi-constituent scores, the selected sites were included among the top-ranked sites that were ranked first through fourth for metals and dioxins. These sites had detections of the 2,3,7,8-TCDD dioxin congener (at low, data not quantified [DNQ]-estimated quantities), which is typically associated with anthropogenic sources, and also had the highest observed dioxin concentrations (noting that the scores do not explicitly account for concentration *magnitude*s, but rather account for *frequency* of exceeding the concentration-based background and permit limit thresholds). Based on the aforementioned ranking results, the utilization of best professional judgment (including consideration of information on planned ISRA and demolition measures), and in line with the BMP Plan's goal of siting BMPs based upon monitoring results, new activities and BMPs will be recommended at four locations on either NASA or Boeing property, as described below. Concept designs for the new activities and BMPs are included in Appendix A. These figures also show the drainage areas that are described below.

2.1 ELV/CM-1 (NASA)

2.1.1 Drainage Area Description

The ELV/CM-1 area (EVBMP0003, located at the CM-1 west sandbag berm) receives flow from the approximately 11.7 acre drainage area, including the ELV building and surrounding paved areas (including the ISRA NASA staging area), vegetated hillside and ELV ISRA areas (most of which are covered with tarps as of September 2012), and the paved Area II (NASA) road. The site is located on property owned by the U.S. Government and administered by NASA. The site includes one area identified by the ISRA program (ELV-1C) that is planned for excavation after 2012. NASA also plans to divert runoff from the upper ELV area toward the helipad through regrading and installation of a curb after 2012.

Culvert modification 1 (CM-1), located shortly downstream of this site, is an existing culvert modification that treats runoff (low flows only) from a 41 acre undisturbed subwatershed, as well as some runoff from this subarea due to an existing broken asphalt channel below the ELV hillside. The existing broken asphalt channel diverts runoff toward the road and then toward CM-1 instead of toward an existing culvert inlet where BMP subarea monitoring location EVBMP0001 is located (which now represents runoff from helipad road and an eastern portion of the broken asphalt ditch, 2.5 acres in total, composited 50/50).

The highest measured TCDD TEQ (no DNQ) concentration since the monitoring program began (2.1x10-4 µg/L) was found at EVBMP0001, including the detection of the 2,3,7,8-TCDD congener (2.2x10-5 µg/L). The underlying soils are dominantly type B soils (moderate infiltration rates) (United States Department of Agriculture National Resources Conservation Service [USDA NRCS], 2007) combined with substantial amounts of exposed bedrock. EVBMP0003 was ranked first (most critical) overall with a multi-constituent score of 0.94, and was ranked first for metals, first for dioxins, 32nd for TSS, and exceeded both the 95th percentile background limits and the permit limits. 2,3,7,8-TCDD was also detected at EVBMP0003 (2.3x10-6 µg/L). Runoff to EVBMP0003, beyond what is retained by the sandbag berm, combines with runoff from the CM-1 east tributary before being treated at CM-1, as capacity is available.

2.1.2 BMP Description

Recommended actions for the ELV area follow upon NASA's current plan to repair the damaged conveyance ditch. The Expert Panel has recommended the installation of a weir within the ditch to divert flow to the south, under the Area II Road by culvert, and into a proposed sedimentation basin and biofilter, or equivalent (Appendix A, Sheet 3). Due to topographical and space constraints (easements and protected oak trees), the conceptual basin was sized to maximize the footprint and capture, rather than sized to the 1 year – 24 hour design storm. Initial calculations suggest that the conceptual design of the sedimentation basin and biofilter would treat 40% of the design storm including drainage from the upper ELV area, and 80% of the design storm excluding the paved upper ELV area (i.e., assuming NASA's proposed diversion to the helipad has been completed). However, it is the Panel's preference that, if feasible in later stages of design, the design be upsized to capture 100% of the 1 year - 24 hour design storm. The conceptual design of the sedimentation basin includes a total depth of approximately 3 feet with 4:1 side slopes and a total capture volume of 17,000 cubic feet. A preliminary investigation of data suggests that that this depth may be limited by shallow bedrock underlying the site as observed on the north side of the Area II Road. The outlet from the sedimentation basin would be located at the lowest elevation within the basin, designed to drain by gravity to the biofilter. The conceptual design of the biofilter is based on an approximate peak flow from the sedimentation basin (0.20 cfs, selected to drain the first half of the volume in 12 hours and the remaining half volume in 28 hours) and the Expert Panel recommended hydraulic loading rate (0.035 gal/min/ft^2), resulting in a biofilter surface area of 2,500 sq-ft. A 1-foot wide triangular channel will be installed around the biofilter perimeter to adequately distribute flow. The distributed flow will drain through 4-inches of topsoil and 18-inches (minimum) of treatment media ending in the gravel collection system, which discharges through an

outlet pipe back into the existing drainage channel with riprap installed for erosion control. The concept is anticipated to drain via gravity to the existing drainage channel. Biological, geotechnical, and utility surveys will need to be performed prior to final design, as well as evaluations of constructability (including consideration of shallow adjacent bedrock, groundwater wells, ISRA and RFI soil remediation plans for the area, and excavation volumes and soil management issues). The sediment basin and biofilter location and configuration will be subject to further evaluations. As an alternative to the current sediment basin concept, an alternative pretreatment system will be evaluated to avoid conflicts with the existing groundwater monitoring wells.

A CM is also recommended at the downstream end of the asphalt ditch west of Helipad Road. This location receives approximately 2.5 acres of runoff from the ELV hillside which flows to the asphalt ditch downstream of the diversion discussed above, as well as runoff from the paved Helipad Road. This runoff would otherwise flow untreated to Outfall 009. The recommended CM would be relatively small due to the very shallow culvert inlet relative to surrounding grades.

It is also recommended that CM-1 be modified to force bypass of runoff from the 41 acre undisturbed drainage from the southeastern slope, thus increasing the sedimentation and detention capacity for the higher priority CM-1 west drainage which will receive only Area II road runoff after previously discussed changes are implemented. There are two potential modification options proposed (options will be refined during future design phases). Option 1 includes the installation of a bypass pipe from the eastern drainage area through the weirboards. A sandbag berm would be installed to detain runoff and direct it to the pipe, thus bypassing the CM-1 media bed. Option 2 involves reconfiguring and rotating the existing CM-1 to face the western slope, limiting inflows to the western drainage and bypassing the eastern drainage. In addition to the recommended bypass, as planning proceeds future studies should be conducted to investigate the feasibility of increasing the storage volume at both CM1 and upstream of the temporary sandbag berm located at the shoulder of the Area II Road.

2.2 24-inch Drain beneath Lower Parking Lot (Boeing)

2.2.1 Drainage Area Description

The 24-inch drain area (monitoring subarea ILBMP0001) receives flow from 23 acres of paved parking areas, building rooftops, paved storage areas, and undeveloped hillsides. Runoff from these areas is conveyed by a storm drain collection system to a 24-inch storm drain located beneath the Lower Parking Lot. This storm drain discharges

via a concrete outlet spillway to the northern drainage on Sage Ranch property. The sedimentation basin and biofilter planned for the Lower Parking Lot will treat approximately 40% of the average annual runoff volume from this subarea. Additionally, the removal of building 1300 is complete (replaced by trailers), building 1436 is planned to be demolished in 2013, and a portion of the upper parking lot will be removed in 2013. In combination, these activities will reduce both the impervious area in this drainage area as well as the potential sources associated with building uses. The downstream percent capture at the low flow diversion will also increase. Based on ten events, this subarea was ranked 3rd overall (multi-constituent score = 0.68), 4th for dioxins, 14th for metals, 39.5 for TSS, and exceeded both the 95th percentile background limits and the permit limits.

2.2.2 BMP Description

Recommended actions for the 24-inch drain area include installing Low Impact Development [LID] features around the trailers at the site of former building 1300 and around the storm drain inlets near the storage areas southeast of Building 1436, as well as installing a vegetated swale along the western edge of the main parking lot. The features are depicted in Appendix A, Sheet 4. Although the trailers on the Building 1300 pad have not yet been installed, appropriate LID features, such as bioswales or biofilters, are proposed for this area and would be sited at later stages of design. These LID features would be designed to capture and treat the 1 year – 24 hour design storm to the extent feasible given potential site-specific constraints and other considerations. North of building 1436, a portion of the existing asphalt parking lot is planned to be removed sometime in early 2013. A vegetated bioswale is recommended to treat runoff from the remaining parking lot (estimated at 0.85 acres) prior to discharging to the 24-inch culvert through the existing inlet near the building. The swale is conceptually designed to capture the peak flow from the 1 year – 24 hour design storm (1.0 cfs) and sized to include the recommended freeboard. The approximate dimensions of the vegetated swale include a bottom width of 4 feet, top width of 11 feet, total depth of 1.2-feet, 3:1 side slopes, and an average longitudinal slope of 1% over a total length of 340-feet; resulting in an approximate excavation volume of 150 cubic yards (including additional excavation for 4-inches of topsoil). To avoid utility easements which extend into the westernmost row of parking spaces, the swale has preliminarily been placed within the westernmost drive lane. This placement is estimated to require the removal of approximately 50 parking spaces and may require a reconfiguration of the parking lot striping.

2.3 B-1 Area (Boeing)

2.3.1 Drainage Area Description

The northern B-1 monitoring subarea (B1BMP0004) reflects runoff from approximately 3.7 acres of paved road and post-ISRA restored hillside. Based on 2 events, this subarea is ranked 2nd overall (multi-constituent score = 0.72), 5th for dioxins, 9th for metals, 74th (lowest) for TSS, and exceeded both the 95th percentile background limits and the permit limits. This subarea drains to a series of rock check dams and the B-1 media filter which, after filtering runoff, discharges to a natural vegetated drainage across the main entrance road. The B-1 media filter also receives runoff from the south, consisting of approximately 0.8 acres of paved and sediment basin discharge, and approximately 0.2 acres of re-vegetated hillside. A portion of the paved road runoff flows from the north along an existing curb, bypassing the media filter before dropping into the southern portion of the media filter, which has less sedimentation area as compared to the north side. Based on four events, the B-1 media filter effluent (B1SW0014-B) is ranked 27th overall (multi-constituent score = 0.27), 19.5 for dioxins, 32.5 for metals, and 74th for TSS.

2.3.2 BMP Description

Recommended actions for the B1 media filter area include installing three 36-inch curb cuts with slope protection designed to increase the capture and conveyance of road runoff to the northern B-1 sedimentation area, to irrigate and reseed the hillside adjacent to the existing check dams, and to create five 18-inch curb cuts along the existing planter curb northwest of the entrance road (across from the B1 Media Filter). These recommendations are depicted in Appendix A, Sheet 5.

To effectively capture runoff from the entrance road, two cuts are recommended between the existing check dams and one before the northern existing gabion. These curb cuts should be designed similarly to the existing 36-inch curb cut on the south. Riprap will be installed to direct water from the road towards the upstream side of the existing check dams to increase the quantity of runoff retained. These curb cuts will reduce the flow toward the southern sedimentation area, increasing the utilized northern sedimentation area. Based on the available topographic information, the runoff from the roadway flows towards the curb on both sides, therefore no modification is necessary to direct flow towards the recommended cuts. However, a topographic survey of the area should be facilitated to ensure this assumption is accurate and that additional modifications would not be required. The hillside located southeast of the

existing check dams will also be irrigated and reseeded (0.2 total acres of surface area) to reduce the likelihood of erosion.

2.4 CM-9 Road Runoff (Boeing)

2.4.1 Drainage Area Description

This subarea, tributary to ILBMP0002, reflects runoff from a 2.5 acre drainage area, which includes paved road and undeveloped hillsides. Based on seven events, the ILBMP0002 subarea is ranked 5.5 overall (tied with EVBMP0002 [helipad site which already has proposed controls], multi-constituent score = 0.66), 12th for dioxins, 3rd for metals, 15th for TSS, and exceeded both the 95th percentile background limits and the permit limits. ILBMP0002 drains through a short pipe which discharges to the natural hillside before entering the CM-9 sedimentation area. CM-9 filters runoff through a horizontal media bed (estimated at 10% average runoff volume capture with the current culvert modification size). The CM-9 drainage area reflects runoff from a total 10.2 acre drainage area, consisting of the 2.5 acres of road runoff discussed above (ILBMP0002), a stabilized dirt road, rocky hillsides, and the AILF (noting however that runoff from the southern portion of A1LF [approximately 0.9 acres] drains towards Outfall 011 where there is an active treatment system in place). Based on four events, the effluent from CM-9 (A1SW0009-B) is ranked 15.5 overall, 19.5 for dioxins, 18.5 for metals, and 15th for TSS. Although this change in rank indicates a water quality improvement from influent to effluent, the recommended improvements described in the next section are anticipated to also increase the percent capture beyond the current 10%. The area has predominantly type D soils (low infiltration rates and high runoff potential) (USDA-NRCS, 2007) and significant exposed bedrock.

2.4.2 BMP Description

Recommended actions for the CM-9 road runoff area include the installation of straw wattles along the drainage path between Building 1300 and the road, installation of slope protection along the existing roadway embankments, the addition of a pretreatment forebay upstream of CM-9, the installation of a perforated pipe between the CM-9 road runoff inlet and the proposed forebay, and improvements to the CM-9 media filter. These recommended improvements are depicted in Attachment A, Sheet 3. Along the bare area northwest of Building 1300, 9-inch x 8-feet wattles are recommended to be spaced 25 feet apart (based on the 16% existing drainage slope) to slow runoff and reduce erosion. Hydroseeding or other stabilization methods could also be implemented if deemed appropriate. The slopes along the Area II roadway are also recommended to be protected with a combination, as deemed most feasible, of

hydroseeding, toe wattles, and the addition of wattles every 10 vertical feet installed based on the existing topography. The addition of a pretreatment forebay located upgradient of the CM-9 media filter would provide additional storage (approximately 1,900 cubic feet) and infiltration, resulting in a reduction in volume and peak flow rates with resultant reduced overflows at the CM-9 media filter. This forebay would be designed utilizing existing topography (large boulder) and a riprap/gravel berm to maximize the storage volume. Potential permitting issues relating to construction in the drainage will need to be further explored in the next design phase. The proposed perforated pipe from the road runoff inlet to the forebay will be elevated aboveground, parallel to the contours, in order to provide increased distribution and infiltration of low flow runoff within the CM-9 drainage area. Finally, it is recommended that the CM-9 media filter be improved and modified to increase both the capacity and contact time. In later design stages, various options will be evaluated including the possibility of expanding or reconfiguring the existing CM.

2.4.3 Project Summary

The four proposed BMPs previously described in this memo are designed to address a combined drainage area of approximately 58.3 acres, or 11% of the 536 acre Outfall 009 watershed. These projects, if fully implemented as recommended by the Expert Panel, have the potential to mitigate a substantial portion of the dioxin stormwater load to Outfall 009 based on recent subarea monitoring results. Additional ISRA excavation and restoration activities are planned within the Outfall 009 watershed at 10 areas (9,000 cubic yards *ex situ*) following the completion of 2012 activities. Potential BMP and performance monitoring will continue as described in the August 2012 Report (MWH et al., 2012) as the site undergoes demolition, remediation, and restoration activities. These continued monitoring activities will help inform the need for and selection of future stormwater controls.

3. SCHEDULE

The following is the anticipated schedule of subsequent action. The Panel has recommended that all of its recommended actions be completed prior to the 2013-2014 rainy season. The schedule is subject to modification as Boeing and NASA continue their discussions with the Panel regarding the BMP activities and as additional information, including observations during the 2012-2013 rainy season, is collected and evaluated.

- December 2012 – Complete Lower Lot Sedimentation Basin and Biofilter, Northern Drainage RMMP, and LOX field work and restoration activities (including plantings).
- February 2013 – Complete 60% designs for B1, 24-inch line, CM-9, and ELV/CM-1 BMPs
- March 2013 – Submit permit applications
- April 2013 – Complete 90% designs for B1, 24-inch line, CM-9, and ELV/CM-1 BMPs
- May 2013 – Complete 100% designs for B1, 24-inch line, CM-9, and ELV/CM-1 BMPs
- June 2013 – Prepare bid documents and select contractor
- July 2013 – October 2013 – Construction of B1, 24-inch line, CM-9, and ELV/CM-1 BMPs (date subject to permits).

5. REFERENCES

Geosyntec Consultants and Santa Susana Site Surface Water Expert Panel, 2012. Santa Susana Site Watershed 008 and 009 BMP Subarea Ranking Analysis. August 31.

Geosyntec Consultants and Santa Susana Field Laboratory Surface Water Expert Panel, 2011. Final 2011 BMP Plan Addendum, Santa Susana Field Laboratory. September 30.

Geosyntec Consultants and Santa Susana Field Laboratory Surface Water Expert Panel, 2010. BMP Subarea Sampling Recommendations for 008/009 BMP Work Plan. December 16.

MWH, 2011. 2011-2012 Best Management Practices (BMP) and Interim Source Removal Action (ISRA) Performance Monitoring Sampling and Analysis Plan for the 008/009 Watershed. December 8. http://www.boeing.com/aboutus/environment/santa_susana/isra.html

MWH, Santa Susana Site Surface Water Expert Panel, and Geosyntec Consultants, 2012. ISRA Performance Monitoring and Potential BMP Subarea Monitoring for the Outfalls 008 and 009 Watersheds, 2011-2012 Rainy Season, Santa Susana Field Laboratory, Ventura County, CA. August 31. http://www.boeing.com/aboutus/environment/santa_susana/isra.html

MWH, Santa Susana Field Laboratory Surface Water Expert Panel, Geosyntec Consultants, Haley & Aldrich, Inc., and CH2M Hill, 2010. Best Management Practices (BMP) Plan, Outfalls 008 and 009 Watersheds, Santa Susana Field Laboratory, Ventura County, California. October 14. http://www.boeing.com/aboutus/environment/santa_susana/water_quality/isra_10-10-19_BMPPlanOF008and009Watersheds.pdf

RWQCB, 2010. Waste Discharge Requirements – The Boeing Company, Santa Susana Field Laboratory, Canoga Park, CA, Order No. R-4-2010-0090, NPDES No. CA0001309. June 16.

Santa Susana Field Laboratory Surface Water Expert Panel and Geosyntec Consultants, 2011a. SSFL Watershed 008 and 009 BMP Site Ranking Analysis Approach. Memorandum to Cassandra Owens, Regional Water Quality Control Board. The Boeing Company, Santa Susana Field Laboratory, Canoga Park, California, Order No. R4-2010-0090, NPDES No. CA0001309, CI No. 6027. June 22.

Santa Susana Field Laboratory Surface Water Expert Panel and Geosyntec Consultants, 2011b. SSFL Watershed 008 and 009 BMP Site Ranking Analysis, July 26.

United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS). 2007. Chapter 7—Hydrologic Soil Groups. Part 630 –Hydrology: National Engineering Handbook, Washington D.C.