

INSTRUMENT READINESS PLAN (IRP)

FOR THE

NSLS-II 04-ID BEAMLINE (ISR)



JUNE 2016

PS-C-XFD-PLN-027

PREPARED BY

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FOR THE

U.S. DEPARTMENT OF ENERGY
OFFICE OF SCIENCE BASIC ENERGY SCIENCE
UNDER CONTRACT DE-SC0012704

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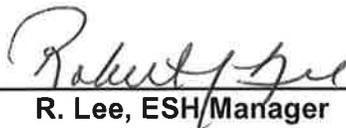
A. Ackerman, Instrument Readiness Coordinator

APPROVED AS A PLAN TO ACHIEVE READINESS BY:



S. Hulbert, IRR Technical Authority

CONCURRENCE BY:



R. Lee, ESH/Manager

APPROVED – IRP HAS BEEN FULLY IMPLEMENTED AND INSTRUMENT IS READY FOR COMMISSIONING:



S. Hulbert, IRR Technical Authority

CONCURRENCE BY:



R. Lee, ESH Manager

VERSION HISTORY LOG

VERSION	DESCRIPTION	DATE
1	Initial Issue	June 2016

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Attachment D, *Completion of IRR Pre-Start Findings*

1.0 INTRODUCTION

1.1 Purpose and Scope

The purpose of this Instrument Readiness Plan (IRP) is to establish the readiness criteria required to declare the NSLS-II 04-ID Beamline (In-Situ and Resonant Scattering [ISR]) ready for commissioning. The scope of this IRP includes the 04-ID Beamline and End Station Diagnostics, and was prepared in accordance with the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001). The Front End and Insertion Device were evaluated in a previous IRR. Experimental equipment that is installed and operational in the End Station will be included in the scope of this plan. The gas handling system is not part of this review.

This IRP will be used as a tool for planning and certifying readiness. The completion of this IRP requires that all procedures, documentation and hardware listed in the plan are completed, tested, and where required, independently certified. In addition, Staff and Users that will be involved in commissioning shall be trained and qualified to conduct their work safely, securely and in an environmentally sound manner.

1.2 04-ID Beamline

The 04-ID Beamline is an insertion device beamline. The objective of the 4-ID beamline is to utilize the NSLS-II source's high undulator brightness coupled with versatile control of the beam size, energy, and polarization for studies of the physics of materials for the 21st century. The source for the ISR is a 23 mm period, in-vacuum undulator (IVU) located in the upstream part of the sector 4 high-beta straight of NSLS-II. The fixed aperture mask accepts a fan of 0.18 mrad x 0.18 mrad (V x H). The credited controls include shielding, an oxygen monitoring and alarm system, a PPS aperture burn-through device, and personnel protection system (PPS) interlocks, in accordance with the NSLS-II Accelerator Safety Envelope (ASE) (PS-C-ESH-ROASE-001).

1.3 Instrument Readiness Review (IRR)

As part of the verification of readiness for commissioning, an IRR is required in accordance with the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001). An independent IRR Team will use the readiness criteria developed as part of this IRP to verify that the 04-ID Beamline is ready for commissioning in accordance with the Beamline Commissioning Plan. Pre-start and post-start findings will be identified by the team.

1.4 Authorization to Proceed with Commissioning

The completion of this IRP, together with closure of any pre-start findings from the IRR, is used as the basis for the NSLS-II Director to authorize the start of commissioning of the 04-ID Beamline.

2.0 INSTRUMENT READINESS PLAN

2.1 Readiness Criteria

Readiness criteria are provided in Attachments A through D. The criteria were developed by the Instrument Readiness Coordinator (IRC) and Readiness Team members, using the *General Readiness Criteria* provided in Attachment A and the *Instrument Readiness Guide* provided in Attachment C of the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001).

The readiness criteria for the 04-ID Beamline are grouped into the following categories:

- Pillar I – Documentation
- Pillar II – Hardware
- Pillar III – Personnel
- Completion of IRR Pre-Start Findings

3.0 IRP IMPLEMENTATION

3.1 Readiness Team

A Readiness Team will be appointed by the NSLS-II Director in accordance with the *Instrument Readiness Review Procedure* (PS-C-ESH-PRC-001). The Readiness Team members that have responsibility for completing the IRP are listed as the Responsible Person in the Attachments.

3.2 Achieving Readiness – Responsibilities

The Readiness Team members are responsible for ensuring that their specific readiness criteria are achieved.

The Lead Beamline Scientist is responsible for certifying that all of the readiness criteria associated with the Beamline is achieved.

3.3 Execution of the IRP

The Readiness Team members shall execute this IRP by preparing, installing, documenting, or training (as appropriate), the specific scope of work (readiness criteria) assigned to them as listed in the Attachments. The Readiness Team members shall develop, compile or assemble the documented evidence that clearly demonstrates that the readiness criteria have been met. This evidence shall be listed on the Attachments.

3.4 Certifying Readiness

Upon completion of the readiness criteria, the Readiness Team members will certify that the criteria for which they are responsible for are complete by signing the Attachments in the appropriate section. The Attachments shall not be signed until the readiness criteria have been fully achieved.

For completion of the IRR pre-start findings, the IRR Technical Authority and the ESH Manager will certify that all IRR pre-start findings relative to the 04-ID Beamline have been completed, and that the associated ATS Actions have been closed by signing Attachment D in the appropriate section. The Independent Verifier will concur that these actions have been adequately completed and closed by signing Attachment D in the appropriate section.

ATTACHMENT A – PILLAR I DOCUMENTATION

04–ID BEAMLINE (ISR)

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR I DOCUMENTATION (PLANNING & PROCEDURES)	<p>Functional Description An overview presentation is prepared that defines the scope of the IRR and includes the following beamline specific information:</p> <ul style="list-style-type: none"> - Primary research capabilities - Beamline layout (includes location on the experiment floor) - Design reviews - Source characteristics - Photon beam performance goals - Radiation Safety Committee reviews - Self-identified pre-start findings - Description and status for each item listed in this Instrument Readiness Plan 	C. Nelson ISR Lead Beamline Scientist	<ul style="list-style-type: none"> • Develop the presentation described 	<ul style="list-style-type: none"> • Presentation • Functional Description Document 	Signature: 
	<p>Beamline Design Beamline components are designed in accordance with PS-QAP-0412, <i>Design Reviews</i> and PS-C-QAS-PRC-010, <i>Engineering Design by Others</i>.</p>	C. Nelson ISR Lead Beamline Scientist	<ul style="list-style-type: none"> • Complete Preliminary and Final Design Reviews (PDR & FDR) for the Beamline that address thermal management, mechanical support, configuration control, and vacuum. 	<ul style="list-style-type: none"> • Requirements, Specifications, and Interface report (RSI) • Internal and contractor supplied design review documents 	Signature: 
	<p>Radiation Safety Components Design Radiation Safety Components designed in accordance with NSLS-II requirements, PS-QAP-0412, <i>Design Reviews</i> and PS-C-QAS-PRC-010, <i>Engineering Design by Others</i>.</p>	C. Nelson ISR Lead Beamline Scientist	<ul style="list-style-type: none"> • Complete requirements analysis and design of radiation safety components 	<ul style="list-style-type: none"> • Internal design review documents • RSC Report 	Signature: 

*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

ATTACHMENT A – PILLAR I DOCUMENTATION
04–ID BEAMLINE (ISR)

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR I DOCUMENTATION (PLANNING & PROCEDURES)	Top-Off Safety System (TOSS) Front End has been analyzed for Top-Off safety in accordance with PS-C-ASD-PRC-183, <i>Approval of New and Modified NSLS-II Beamline Front Ends for Top Off Safety</i> .	R. Filler Coordinator for Top Off Safety	<ul style="list-style-type: none"> Complete TOSS analysis 	<ul style="list-style-type: none"> TOSS Analysis Report Updated front end layout drawings Updated <i>Beamlines Approved for Top-Off Operations</i> list 	Signature: 
	Ray Traces Bremsstrahlung and Synchrotron Ray Traces generated in accordance with PS-C-XFD-PRC-008, <i>Synchrotron and Bremsstrahlung Ray Trace Procedure</i> .	C. Nelson ISR Lead Beamline Scientist	<ul style="list-style-type: none"> Prepare the Ray Traces 	<ul style="list-style-type: none"> Primary Bremsstrahlung Ray Traces Maximum Synchrotron Ray Traces 	Signature: 
	Secondary Radiation Scatter Analysis Secondary Bremsstrahlung and Synchrotron scatter is analyzed in accordance with LT-C-ESH-STD-001, <i>Guidelines for the NSLS-II Beamline Radiation Shielding Design</i> .	M. Benmerrouche Health Physics	<ul style="list-style-type: none"> Complete FLUKA analysis Complete STAC8 analysis 	<ul style="list-style-type: none"> BNL Technical Note Report 	Signature: 
	National Environmental Protection Act (NEPA) Evaluation NEPA requirements evaluation completed.	L. Stiegler ESH Operations Group Leader	<ul style="list-style-type: none"> Complete a NEPA evaluation 	<ul style="list-style-type: none"> NEPA Evaluation Report 	Signature: 

*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT A – PILLAR I DOCUMENTATION
04-ID BEAMLINE (ISR)**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR I DOCUMENTATION (PLANNING & PROCEDURES)	<p>Unreviewed Safety Issue (USI) Evaluations/ Screenings Authorization basis hazard identification is managed through USI evaluation/screening.</p>	S. Moss Authorization Basis Manager	<ul style="list-style-type: none"> Verify that the SAD and ASE accurately cover the hazards associated with the subject beamline; including temporary systems 	<ul style="list-style-type: none"> SAD and ASE USI screening/evaluation Applicable waivers 	Signature: 
	<p>Resolution of Open Action Tracking System (ATS) Actions All action items from previous internal and external oversight groups (e.g., RSC, Design Reviews, etc.) have been closed.</p>	J. Zipper QA Engineer	<ul style="list-style-type: none"> ATS action items shown as closed with supporting evidence  	<ul style="list-style-type: none"> ATS System 	Signature: 
	<p>Procedures Procedures needed for safe, secure, and environmentally sound commissioning have been developed, reviewed, validated (where applicable), and approved. Existing procedures are verified as sufficient for new hazards introduced by this beamline, if any.</p>	K. Rubino Procedure Support	<ul style="list-style-type: none"> Develop any system specific procedures Verify that existing procedures are sufficient for any new hazards introduced, if any 	<ul style="list-style-type: none"> Insertion Device LOTO Procedure (PS-C-ASD-PRC-185 & 179) 04-ID Radiological Interlock Test Procedure (PS-C-XFD-PRC-057) Search and Secure Sketch Cryocooler Procedure (PS-C-XFD-PRC-034) 	Signature: 
	<p>Commissioning Plan A commissioning plan generated to address the task sequence required for technical commissioning (safe photon transport).</p>	C. Nelson ISR Lead Beamline Scientist	<ul style="list-style-type: none"> Prepare a Commissioning Plan 	<ul style="list-style-type: none"> Approved Commissioning Plan 	Signature: 

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**Note: ATS action 8053.2.7 "IR Action Item # 7: Provide Permanent Attachment for IV Water system Cooling Lines" will be closed during the August 2016 shutdown. The current condition poses no safety threat for commissioning the IV in cell 4.*

ATTACHMENT A – PILLAR I DOCUMENTATION
04–ID BEAMLINE (ISR)

READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
<p>Radiation Survey Plan A survey plan is generated in accordance with PS-C-XFD-PRC-004, <i>NSLS-II Beamlines Radiation Safety Commissioning Plan</i>.</p>	<p>Mo Benmerrouche Radiation Physicist</p>	<ul style="list-style-type: none"> • Prepare the Radiation Survey Plan 	<ul style="list-style-type: none"> • Approved Radiation Survey Plan 	<p>Signature:</p> 

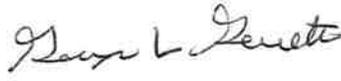
*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT B – PILLAR II HARDWARE
04–ID BEAMLINE (ISR)**

	READINESS CRITERIA	RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II SAFETY CRITICAL HARDWARE (INSTALLATION)	<p>Radiation Safety Components: Installation Radiation safety components, including Top Off Components, are installed in accordance with the Traveler.</p>	<p>C. Nelson ISR Lead Beamline Scientist</p>	<ul style="list-style-type: none"> • Generate and execute Traveler 	<ul style="list-style-type: none"> • Completed Traveler 	<p>Signature: </p>
		<p>L. Doom Accelerator Coordination</p>	<ul style="list-style-type: none"> • Generate and execute Top-Off Traveler 	<ul style="list-style-type: none"> • Completed Traveler 	<p>Signature: </p>
	<p>Radiation Safety Components: Configuration Control A Radiation Safety Component Checklist template is generated in accordance with PS-C-ESH-PRC-025, <i>NSLS-II Radiation Safety Component Inspection Procedure</i>.</p>	<p>C. Nelson ISR Lead Beamline Scientist</p>	<ul style="list-style-type: none"> • Develop Radiation Safety Component Checklist • Assure that FE safety component checklist includes TOSS components 	<ul style="list-style-type: none"> • Approved beamline specific Radiation Safety Component Checklist • Approved SR Radiation Safety Component Checklist (includes TOSS) 	<p>Signature: </p>
	<p>Area Radiation Monitors (ARMs) ARMs are installed in accordance with PS-C-ESH-ARN-SPC-001, <i>NSLS-II Area Radiation Monitor (ARM) System Description</i> and PS-C-ESH-STD-002, <i>Technical Basis Document for Interlocked Area Monitors Placement Outside the Accelerator and Beamlines Enclosures</i>.</p>	<p>M. Benmerrouche ARM Technical Authority</p>	<ul style="list-style-type: none"> • Install, calibrate, and test (EPICS integration) ARMs • Certify (PPS) 	<ul style="list-style-type: none"> • ARM Layout Drawing • ARM calibration certificates • ARM EPICS Interface Integration Test Sheet • ARM PPS Test checklist 	<p>Signature: </p>

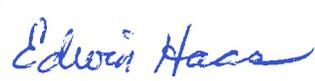
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**ATTACHMENT B – PILLAR II HARDWARE
04–ID BEAMLIN (ISR)**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II SAFETY CRITICAL HARDWARE (INSTALLATION)	<p>Personnel Protection System (PPS) Interlocks: Install and Certify Hardware/Software installed in accordance with PS-C-XFD-SPC-PPS-001, <i>Beamline Personnel Protection System (BLPPS) and Front End Personnel Protection System (FEPPS) Design Description</i>. PPS certified in accordance with the beamline specific interlock certification procedure.</p>	<p>G. Ganetis Electrical Engineering Group Leader</p>	<ul style="list-style-type: none"> • Generate system schematics and logic diagrams • Install PPS components • Certify PPS 	<ul style="list-style-type: none"> • Overall PPS Checklist • Executed Beamline Radiological Interlock Certification Checklist 	<p>Signature:</p> 
	<p>O2 Sensors: Install Oxygen sensors and alarms required to alert personnel to oxygen deficiency hazard (ODH) conditions installed in accordance with the design drawing.</p>	<p>S. LaMarra ODH Technical Authority</p>	<ul style="list-style-type: none"> • Generate design drawing • Generate and execute Traveler 	<ul style="list-style-type: none"> • Design drawing • Completed Traveler 	<p>Signature:</p> 
	<p>O2 Sensors: Certify ODH monitoring system has been certified in accordance with PS-C-XFD-PRC-005, <i>Beamline Enclosures and Cryogen Fill Station ODH Monitoring and Alarm System Certification and Inspection</i>.</p>	<p>B. Heneveld ESH Engineer</p>	<ul style="list-style-type: none"> • Perform certification 	<ul style="list-style-type: none"> • Certification Report 	<p>Signature:</p> 

*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT B – PILLAR II HARDWARE
04-ID BEAMLINE (ISR)**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II SAFETY CRITICAL HARDWARE (INSTALLATION)	<p>Hutch Structures Hutch structures installed with adequate provision for life safety issues (egress and fall protection) in accordance with LT-SOW-XF-HU-0001, <i>Statement of Work for NSLS-II Beamline Shielding Enclosures (“Hutches”)</i>, LT-C-XFD-SPC-HU-001, <i>NSLS-II Lead/Steel Beamline Shielding Enclosures</i>, and LT-C-XFD-SPC-HU-002, <i>NSLS-II Steel Beamline Shielding Enclosures</i>.</p>	E. Haas Beamline Engineer	<ul style="list-style-type: none"> • Generate and execute Traveler for inspection 	<ul style="list-style-type: none"> • Completed Traveler 	Signature: 
	<p>Electrical Power SBMS electrical power distribution requirements are satisfied. SBMS Electrical Equipment Inspection (EEI) requirements are satisfied.</p>	A. Boerner Electrical Distribution Engineer	<ul style="list-style-type: none"> • Generate and approve one-line drawings • Complete system electrical inspection • Complete needed EEI inspections 	<ul style="list-style-type: none"> • Approved AC Power one-line drawings • EEI database entry 	Signature:  6/28/16
	<p>Utilities Permanent utility systems are installed and tested (i.e., Compressed Air, DI Water, Gaseous Nitrogen, Process Chilled Water) in accordance with design drawings.</p>	J. Gosman Mechanical Utilities Group Leader	<ul style="list-style-type: none"> • Generate system schematics • Generate and execute Traveler • Perform pressure test 	<ul style="list-style-type: none"> • Approved system schematics • System pressure testing reports • Completed Traveler 	Signature: 

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**ATTACHMENT B – PILLAR II HARDWARE
04–ID BEAMLINE (ISR)**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II OTHER HARDWARE (INSTALLATION)	Other Photon Transport Components, Optics, and Diagnostics Photon transport components that are not radiation safety components are installed and tested in accordance with the Traveler. Diagnostic equipment needed to begin technical commissioning is installed and tested.	C. Nelson ISR Lead Beamline Scientist	<ul style="list-style-type: none"> • Generate and execute Traveler • Complete vendor acceptance tests 	<ul style="list-style-type: none"> • Completed Traveler • Vendor acceptance test documentation, as needed 	Signature: 
	Equipment Protection System (EPS) Interlocks Hardware/Software installed and tested in accordance with the Traveler.	R. Kadyrov Controls Infrastructure Group Leader	<ul style="list-style-type: none"> • Generate and execute Traveler • Verify EPICS integration • Generate Test Report 	<ul style="list-style-type: none"> • Test Report • Completed Traveler 	Signature:  25392
	Controls Hardware/Software installed and tested in accordance with NSLS-II requirements.	Z. Yin Controls Group Engineer	<ul style="list-style-type: none"> • Test system performance • Complete integral testing 	<ul style="list-style-type: none"> • Performance and integral testing checklist 	Signature: 

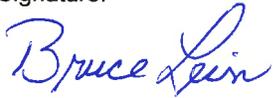
*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT B – PILLAR II HARDWARE
04-ID BEAMLINE (ISR)**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR II OTHER HARDWARE (INSTALLATION)	<p>Vacuum Vacuum hardware has been installed and tested in accordance with the Traveler and has the capability of achieving full vacuum needed during commissioning.</p>	<p>R. Todd Vacuum Engineer</p>	<ul style="list-style-type: none"> • Generate and execute Top Level Traveler • Identify overpressure devices • Test system perform 	<ul style="list-style-type: none"> • Completed Top Level Traveler • Test Report 	<p>Signature:</p> <p>FOR ROB TODD</p> <p><i>Chh Htpt</i></p> <p>6/27/16</p>

*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT C – PILLAR III PERSONNEL
04–ID BEAMLINE (ISR)**

READINESS CRITERIA		RESPONSIBLE PERSON	ACTIONS	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
PILLAR III PERSONNEL	Lead Beamline Scientist (LBS) / Cognizant Space Manager (CSM) LBS and CSM personnel are assigned and Trained/Qualified.	B. Lein Training Group Leader	<ul style="list-style-type: none"> Assign JTA for LBS and CSM 	<ul style="list-style-type: none"> BTMS record 	Signature: 
	Authorized Beamline Staff Sufficient personnel to begin commissioning are assigned and Trained/Qualified.	B. Lein Training Group Leader	<ul style="list-style-type: none"> Assign JTA 	<ul style="list-style-type: none"> BTMS record 	Signature: 
	Support Staff Other, non-beamline dedicated personnel needed to begin commissioning (e.g., Beamline Engineers and Controls Personnel) are assigned and Trained/Qualified.	B. Lein Training Group Leader	<ul style="list-style-type: none"> Assign JTA 	<ul style="list-style-type: none"> BTMS record 	Signature: 
	Lead Operators & FLOCOS (Accelerator Division) Trained/Qualified to: <ul style="list-style-type: none"> Execute the Beamline Enable procedure Perform roles assigned in any Beamline-specific procedures 	B. Lein Training Group Leader	<ul style="list-style-type: none"> Train Operators 	<ul style="list-style-type: none"> BTMS record 	Signature: 

* READINESS CERTIFICATION	C. Nelson – ISR Lead Beamline Scientist	Signature: 
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*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.

**ATTACHMENT D – COMPLETION OF IRR PRE-START FINDINGS
04-ID BEAMLINE (ISR)**

READINESS CRITERIA		RESPONSIBLE PERSON	DOCUMENTED EVIDENCE	CERTIFICATION OF READINESS*
IRR PRE-START FINDINGS	Actions Complete All actions associated with the subject Beamline(s) IRR pre-start findings are completed and the ATS Actions are closed.	S. Hulbert IRR Technical Authority	• ATS	Signature:
	Actions Closed All actions associated with the 04-ID Beamline IRR pre-start findings have been verified complete and the ATS Condition is closed. (ATS Condition No. _____)	R. Lee ESH Manager	• ATS	Signature:
	Actions Verified Actions associated with the 04-ID Beamline IRR pre-start findings have been satisfactorily completed.	E. Cheswick Independent Verifier	• ATS	Signature:
	No Pre-Start Findings Identified No pre-start findings have been identified by the Review Team and therefore the previous three lines do not require sign-off.	R. Lee ESH Manager	• IRR Preliminary Report	Signature: <i>R. Lee</i> for 7/1/2016
		E. Cheswick Independent Verifier	• IRR Preliminary Report	Signature: <i>E. Cheswick</i> 7-1-16

- END -

*Signature certifies that the readiness criteria are met. The Responsible Person shall not sign prior to completion.