



Project HAZARD IDENTIFICATION AND RISK ASSESSMENT (HIRA)/BASELINE RISK ASSESSMENT (BRA)— DBSA-NDoH-GF PSA OXYGEN PLANTS Cluster 2 Hospital Projects

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1. Project Information

Project: DBSA-NDoH-GF PSA OXYGEN PLANTS — Cluster 2 Hospital Projects

Project Sites (Cluster 2): Bela-Bela Hospital; Jubilee Hospital; Seshego Hospital; Mecklenburg Hospital; Lydenburg (Mashishing) Hospital; Sabie Hospital; Tintswalo Hospital; Kwa-Mhlanga Hospital.

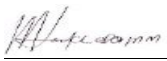
Document: Project Health and Safety Risk Assessment (Baseline Risk Assessment) (Project HIRA / BRA) — DBSA-NDoH-GF PSA OXYGEN PLANTS Cluster 2 Hospital Projects

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2. Context and Background

The National Department of Health (NDoH), as Principal Recipient of the Global Fund (GF) grant, has expanded the Development Bank of Southern Africa's (DBSA) mandate as Implementing Agent to include a nationwide rollout of solar-powered backup systems. This initiative forms part of the Containerised PSA Oxygen Plants Programme and will be implemented across twenty (20) hospital facilities identified by the NDoH. The objective is to ensure uninterrupted oxygen supply through reliable backup power solutions. The programme includes a thirty-six (36) month post-installation maintenance and support period and will be implemented on an accelerated timeline requiring multiple concurrent service providers. This baseline HIRA/BRA sets minimum programme-level risk expectations and requires tenderers to demonstrate multi-site delivery and maintenance capability

3. Contract Duration and Programme Timelines

- Contract duration: **38 months** from date of site handover.
- Design, Supply, Installation, Commissioning: **Estimated 2 months per site** (market dependent).
- Maintenance Period: **36 months** after commissioning.

- Programme delivered on an accelerated timeline requiring multiple concurrent service providers.

4. Scope of Work

Supply, delivery, offloading, storage, installation, testing, commissioning and handover of PV arrays, BESS installations, LV distribution and protection, civil works (foundations, trenches, cable ducts), temporary works (scaffolding, formwork, shoring), and all associated works at Clusture 2 hospitals while maintaining uninterrupted clinical services and protecting PSA oxygen plant operations.

Scope includes the 36-month post-installation maintenance period and programme-level controls (central monitoring, spare parts logistics and standardised FAT/SAT protocols

5. Key activities included:

- Civil works: excavation, foundations, trenches, cable ducts, access roads, drainage and reinstatement.
- Structural works: carport and PV mounting structures, steelworks and roof penetrations.
- PV works: module mounting, stringing, DC cabling, array earthing, labelling and lightning protection interfaces.
- BESS works: delivery, offloading, storage, installation of battery containers/rooms, battery module handling, thermal management, battery monitoring and commissioning.
- Electrical works: LV distribution, inverter installation, earthing and bonding, protection coordination, temporary supplies and final connections to hospital systems.
- Temporary works: scaffolding, formwork, shoring, propping, crane bases and temporary services.
- Testing and commissioning: FAT, SAT, energisation, first charge and handover documentation.
- Hospital interface: coordination with PSA oxygen plant, emergency power, patient access and hospital logistics.

6. Legal Framework

6.1. Primary legislation and standards to be applied

- **Occupational Health and Safety Act 85 of 1993** and associated regulations.
- **Construction Regulations 2014 (CR)** — duties of Client, Principal Contractor and contractors; PHSP and H&S File requirements.
- **National Environmental Management Act (NEMA)** and applicable environmental regulations.
- **SANS** and **IEC** standards relevant to PV, BESS and electrical installations (e.g., SANS 10142-1, IEC 62446, IEC 62109, IEC 62619).
- Local municipal bylaws and hospital site rules.
- Contract documents and Section 37(2) Health & Safety Agreement where applicable.

7. Risk Assessments

7.1. Risk Classification Methodology and Matrix

Aligned with ISO 31010 and ISO 45001. Risks are assessed using **Severity (S)** and **Likelihood (L)**.

The Principal Contractor is responsible for applying this matrix, implementing control measures, and managing residual risks.

Severity (S):

Severity (S)	Description	Example
1	Minor	Superficial burn, first aid only
2	Moderate	Medical treatment, equipment damage < \$10k
3	Major	Lost-time injury, fire contained on-site
4	Severe	Multiple injuries or partial structural loss
5	Catastrophic	Fatality, explosion, total facility loss

Definitions

Severity Scale

- 1 – Minor Injury:** First aid only, no lost time.
- 2 – Moderate Injury:** Medical treatment, short-term lost time.
- 3 – Serious Injury:** Hospitalization, long-term lost time.
- 4 – Major Injury:** Permanent disability, life-changing injury.
- 5 – Fatality:** Single or multiple deaths

Likelihood (L):

Severity (S)	Description	Example
1	Rare	Highly unlikely
2	Possible	Could occur occasionally
3	Likely	Occurs periodically
4	Frequent	Monthly events
5	Continuous	Weekly/Daily occurrence

Definitions

Likelihood Scale

- 1 – Rare:** May occur only in exceptional circumstances.
- 2 – Unlikely:** Could happen but not expected during project.
- 3 – Possible:** Might occur at some time during works.
- 4 – Likely:** Will probably occur in most circumstances.
- 5 – Almost Certain:** Expected to occur frequently or regularly.

Risk Rating = Severity × Likelihood

Range	Category	Action
1 – 5	Low	Acceptable – monitor
6 – 10	Medium	Review controls
11 – 15	High	Immediate supervision
16 – 25	Critical	Stop work – rectify immediately

Risk Matrix Table (S × L):

Severity \ Likelihood	1 - Rare	2 - Possible	3 - Likely	4 - Frequent	5 - Continuous
1 - Minor	1	2	3	4	5
2 - Moderate	2	4	6	8	10
3 - Major	3	6	9	12	15
4 - Severe	4	8	12	16	20
5 - Catastrophic	5	10	15	20	25

Definitions

Risk Rating

Low (Green): Acceptable with routine controls.

Medium (Amber): Requires management attention and monitoring.

High (Red): Significant risk; must be reduced before work proceeds.

Critical (Red): Unacceptable; work must not proceed until risk is controlled.

How to use this table:

- **Raw Risk Score** = Likelihood × Severity before controls.
- **Residual Risk Score** = Likelihood × Severity after controls.

- **Critical/High risks** (≥ 11) must have strict controls and continuous monitoring.
- **Update Review Date** regularly (monthly or after incidents).

Application

- **The Principal Contractor must use this matrix to:**
 - Score each activity (raw risk).
 - Apply controls (aligned with ISO/HSE hierarchy).
 - Re-score residual risk.
 - Document monitoring frequency and review dates in the Risk Register.

This ensures compliance with CDM Regulations, ISO 31000 risk management cycle, and the International HSE “Plan-Do-Check-Act” framework.

8. Baseline Risk Assessment

8.1. Purpose

Provide a client-side baseline HIRA (BRA) that identifies project hazards, assigns raw risk scores, prescribes minimum controls required from the Principal Contractor, and sets expected residual risk targets and evidence required for tender evaluation and PHSP acceptance.

9. HIRA/BRA Scope of Work

Covers all activities in the project scope: civil, structural, PV, BESS, electrical, temporary works, testing and commissioning, hospital interfaces and environmental hazards specific to the provinces where Cluster 2 hospitals are located.

10. Responsibilities

- **Client / PrCHSA:** Issue baseline HIRA; verify PC submissions; accept PHSP and H&S File.
- **Principal Contractor:** Complete and return the HIRA with PC residual scoring and evidence; implement controls; maintain H&S File.
- **DBSA Appointees:** Verify technical evidence (electrical, structural, mechanical) and witness critical tests.

11. Project Specific HIRA BRA Table

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
BESS Thermal Runaway	Cell/module propagation causing fire, toxic gas, facility loss	3	5	15	OEM TRP report; BMS redundancy; thermal sensors and alarms; ventilation; OEM-endorsed BTRRP integrated with ERP; FAT/SAT witness; energisation PTW	2	4	8	Yes; Battery handling / Thermal runaway permit; Energisation PTW	PC Project Manager; BESS OEM Rep; CHSM(if applicable/CHSO)	OEM TRP; BMS test logs; BTRRP; FAT/SAT witness statement; energisation PTW
PSA Oxygen Plant Interruption	Works or energisation interrupt or	2	5	10	Written hospital approvals; isolation SOPs; redundant	1	4	4	Yes; Works affecting critical services permit	PC; Hospital Engineering;	Written approvals; isolation

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×S)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
	contaminate PSA supply causing patient harm				supply checks; schedule works outside clinical windows; DBSA Engineer sign-off					DBSA appointed Engineer	certificates; DBSA sign-off
PV DC Electrical Shock Arc Flash	Contact or arc during stringing testing commissioning	3	4	12	SANS/IEC compliance; registered electricians; LOTO; isolation certificates; arc-flash study; PPE; energisation PTW; OEM witness	2	3	6	Yes; Electrical isolation / Energisation PTW	Registered Electrician; CHSO	Arc-flash study; electrician LOAs; LOTO certificates; test records

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
Lifting Crane Operations near Hospital Access	Dropped load or crane failure impacting patients ambulances	3	5	15	Detailed lift plans; ground bearing tests; exclusion zones; banksman; TMP; DBSA Structural sign-off; Permit to Work	2	4	8	Yes; Lifting / Crane operation permit	Lifting Supervisor; Crane Operator; DBSA appointed Structural Engineer	Lift plan; crane test cert; ground test report; banksman LOA
Excavation Strike to Underground Services	Strike of power oxygen reticulation or services causing outage release collapse	4	4	16	Utility wayleave verification; as-built records; CAT/GPR scanning; hand-digging near services; TWD shoring design; excavation	2	3	6	Yes; Excavation / Trenching permit	Excavation Supervisor; TWD; Registered Electrician	Utility confirmations; CAT/GPR reports; shoring design; excavation permit

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
					permit; daily inspections						
Hot Works Ignition near BESS Fuel	Hot works ignite fuel or combustibles causing fire spread to BESS PSA	3	4	12	Hot works permit; fire watch; exclusion zones; fuel bunding; fire extinguishers; BTRRP linkage; scheduling	2	3	6	Yes; Hot works permit	Fire Safety Officer; Hot Works Authoriser	Hot works permit; fire watch log; fuel storage cert
Battery Module Manual Handling	Dropped module or strain injury during handling installation	3	3	9	Mechanical lifting aids; OEM handling SOPs; certified lifting fixtures; SWMS;	2	2	4	Yes; Lifting permit for modules	Lifting Supervisor; BESS OEM Rep	Handling SOP; training records; lifting equipment certs

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
					trained handlers; medical surveillance						
Working at Height on Carports Roofs	Fall from roof carport scaffold causing serious injury fatality	4	4	16	Working at Heights Plan; certified anchors; fall arrest PPE; rescue plan; scaffold tagging; medical fitness	2	3	6	Yes; Working at Height permit	Construction Supervisor; CHSO	Anchor certs; rescue plan; scaffold inspection tags; medical fitness
Mobile Equipment Collision Rollover	Vehicle collision or rollover near hospital access blocking access injuring persons	3	4	12	Site TMP; segregated routes; ROPS and seat belts; operator competence LOAs;	2	3	6	Yes; Traffic management permit for major movements	Fleet Manager; Site Traffic Coordinator	TMP; operator certificates; pre-op check logs

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
					pre-op checks; speed limits						
Dust Migration into Clinical Areas	Dust contaminates clinical zones affecting patients sterile areas	4	3	12	Dust suppression water sprays; covered loads; wheel wash; dust monitoring; coordination with hospital infection control; temporary screens	2	2	4	No; PTW recommended for high-dust activities	Environmental Officer; CHSO	Dust monitoring logs; wheel wash records; infection control sign-off
Chemical Exposure	Spill vapour exposure causing	3	4	12	SDS on site; bunded storage; spill kits and trained responders; PPE; chain-of-custody	2	3	6	Yes; Hazardous chemical handling permit	Environmental Officer; CHSO	SDS; spill drill records; waste disposal receipts

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
Electrolyte Fuels	burns respiratory harm				for battery waste; EMP						
Public Pedestrian Interface Excavations	Public falls into excavation or exposed hazard causing severe injury	4	5	20	Public barriers hoarding ≥1 m and 1 kN impact; night illumination; signage; secure perimeter; community liaison; public notices	1	3	3	No; site security plan required	PC Site Security; Community Liaison	Barrier photos; lighting plan; liaison minutes
Noise Impact on Patients	High noise during critical clinical windows affecting patient care	4	2	8	Schedule noisy works outside critical windows; acoustic screens; temporary enclosures; notify	2	1	2	No; works scheduling approval required	Site Manager; CHSO	Noise mitigation plan; notification records

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
					hospital; PPE for workers						
Heat Stress for Workers	Heat illness during outdoor works causing exhaustion heat stroke	3	3	9	WBGT monitoring; work-rest schedules; hydration stations; acclimatisation records; shaded rest areas; first aid	2	2	4	No; medical surveillance required	CHSM (if applicable)/CHSO ; Site Medic	WBGT logs; work-rest schedules; medical records
Tool Equipment Dropped from Height	Dropped tool strikes personnel below causing injury	3	3	9	Tool tethering; exclusion zones under work at height; PPE; tool inspection register; toolbox talks	2	2	4	No; included in WAH permit where applicable	Construction Supervisor; CHSO	Tool tether register; inspection records

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
Mechanical Failure of Plant	Equipment failure causing injury or service loss	3	4	12	Pre-op checks; preventative maintenance program; acceptance process for new plant; inspection certificates	2	3	6	No; PTW for major plant movements	Maintenance Supervisor; Fleet Manager	Maintenance logs; acceptance certificates
Radiation Troxler Gauge Misuse	Source damage leak during geotechnical testing causing exposure	1	4	4	Authorised operator only; radiation permit and signage; secure transport and storage; emergency procedure	1	2	2	Yes; Radiation permit where used	Geotechnical Supervisor; CHSO	Radiation permit; operator LOA; transport records

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
Venomous Snake Bite Provincial Risk	Worker bitten during clearing excavation in snake-prone areas causing envenomation	3	3	9	Prestart area checks; snake awareness training; first aid and medevac plan; antivenom readiness or rapid transfer arrangements; no lone work; gaiters for clearing	2	2	4	No; biohazard controls mandatory	Site Supervisor; CHSO	Training records; medevac plan; antivenom availability note
Flooding Stormwater Ingress	Heavy rains flood works trenches or BESS areas causing damage safety risk	3	4	12	Stormwater management plan; temporary drainage; stop-work criteria during heavy rain;	2	3	6	No; weather contingency PTW for critical works	Environmental Officer; Site Manager	Stormwater plan; weather logs; drainage records

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
					secure storage; daily weather monitoring						
Theft Vandalism Security Breach	Theft vandalism of equipment causing delays hazards	3	3	9	Secure compound; CCTV; night security; asset tagging; controlled access; visitor register	2	2	4	No; security plan required	PC Site Security	Security logs; CCTV footage; asset register
Infectious Contamination Risk	Construction activity increases infection risk to patients	3	4	12	Infection control coordination with hospital; dust suppression; restricted access near clinical areas; PPE	2	3	6	No; hospital infection control sign-off required	Environmental Officer; Hospital Infection Control	Infection control sign-off; waste records

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
					and hygiene stations; waste segregation						
Manual Handling General	Musculoskeletal injury from lifting modules cables materials	3	3	9	Mechanical aids; manual handling training; task-based RA; team lifts; SWMS for heavy lifts	2	2	4	No; SWMS required for heavy lifts	Construction Supervisor; CHSO	Training records; mechanical aid certificates
Confined Space Entry Battery Rooms Pits	Asphyxiation toxic exposure in confined battery rooms pits	2	5	10	Confined space permit; atmospheric testing continuous monitoring; standby rescue team and	1	4	4	Yes; Confined space permit	Confined Space Supervisor; CHSO	Gas test records; rescue team LOAs; confined space permit

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
					equipment; trained entrants; rescue drills						
Working Near PSA Mechanical Interfaces	Mechanical works damage PSA piping controls causing PSA failure	2	5	10	Mechanical isolation procedures; DBSA Engineer sign-off; written hospital approvals; mechanical SWMS; PTW for works affecting critical services	1	4	4	Yes; Works affecting critical services permit	PC; DBSA appointed Engineer; Hospital Engineering	Written approvals; isolation certificates; DBSA sign-off
Temporary Works Failure Scaffolding	Collapse of temporary works	3	5	15	Temporary works design by TWD; temporary works register; inspections	2	3	6	Yes; Temporary works permit	Temporary Works Designer; PC	TWD design; inspection records;

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
Formwork Shoring	causing injury structural damage				before use; temporary works permit; competent erectors supervisors						temporary works permit
LOTO Failure during Electrical Work	Incomplete isolation leading to unexpected energisation during work	2	5	10	Centralised LOTO system; written isolation certificates; unique lock/tag identifiers; verification by registered electrician; LOTO register	1	4	4	Yes; Electrical isolation / LOTO permit	Registered Electrician; CHSO	Isolation certificates; LOTO register; electrician verification

Hazard	Description of Scenario Unwanted Event	L (1-5)	S (1-5)	Raw Risk (LxS)	Control Measures (minimum client requirement)	Residual L (1-5)	Residual S (1-5)	Residual Risk (LxSr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
Fire Spread from Adjacent Site	Fire spreads from neighbouring site to hospital systems BESS	2	5	10	Firebreaks; liaison with neighbours; fire watch; BTRRP linkage; emergency contact list; fuel storage controls	1	4	4	No; hot works permit and fire plan required	Fire Safety Officer; CHSO	Fire plan; neighbour liaison records; fuel storage cert
Contractor Fatigue Impairment	Fatigue substance impairment causing errors incidents	3	4	12	Fatigue management plan; shift rostering; drug and alcohol testing policy; pre-shift fitness checks	2	3	6	No; HR controls mandatory	HR Manager; CHSM (if applicable/CHSO)	Fatigue plan; testing records; rosters

Hazard	Description of Scenario Unwanted Event	L (1–5)	S (1–5)	Raw Risk (L×S)	Control Measures (minimum client requirement)	Residual L (1–5)	Residual S (1–5)	Residual Risk (L×Sr)	PTW Trigger (Yes/No; type)	Responsible Person	Evidence Required
Environmental Wildfire Risk	Bushfire encroachment during dry season threatening site hospital	2	5	10	Wildfire contingency plan; stop-work criteria; liaison with local fire services; vegetation clearance around perimeter	1	4	4	No; emergency plan required	Environmental Officer; Fire Safety Officer	Wildfire plan; liaison records
Traffic Management Failure Deliveries Crane Movements	Delivery crane traffic disrupts emergency access causes collisions	3	5	15	TMP; crane movement scheduling; emergency access protection; banksmen traffic marshals; temporary signage lighting	2	4	8	Yes; Traffic management permit for major movements	Site Traffic Coordinator; PC	TMP; movement permits; traffic marshal LOAs

12. Programme-level Risks and Requirements

This programme-level risk block identifies high-level risks that arise from the accelerated, multi-site rollout and the 36-month post-installation maintenance period. Tenderers must address each programme risk in their submission by providing a concise mitigation plan (owner, actions, resources, timeline, KPIs and evidence). The table below lists the required programme risks (P01–P05) and the minimum content the tenderer must include in their mitigation plan.

Risk ID	Risk Title	One-line Description	Potential Impact	L (1–5)	S (1–5)	Raw (L×S)	Risk Category	Tenderer must submit (minimum mitigation plan content)
P01	Multi-site Delivery Failure	Failure to mobilise sufficient contractors, equipment or resources to meet the accelerated multi-site schedule.	Programme delay; cost escalation; delayed patient benefit.	4	4	16	Programme / Commercial	Resource and mobilisation plan; resourcing Gantt for concurrent sites; contingency suppliers; escalation protocol; KPIs and recovery actions.
P02	Maintenance Service Failure	Inadequate maintenance capacity, spare-parts logistics or SLA performance during the 36-month support period.	System downtime; PSA risk; patient safety impact.	3	5	15	Operational / Service	36-month maintenance plan; spare parts inventory and distribution strategy; SLA metrics (response/repair times); staffing and training plan; escalation and reporting.

Risk ID	Risk Title	One-line Description	Potential Impact	L (1–5)	S (1–5)	Raw (L×S)	Risk Category	Tenderer must submit (minimum mitigation plan content)
P03	OEM Data and TRP Availability	Missing or delayed OEM technical data, TRP reports or commissioning procedures across multiple sites.	Commissioning delays; safety non-compliance; withheld energisation.	3	4	12	Technical / Compliance	OEM data register per site; TRP evidence; FAT/SAT schedule; contractual OEM commitments and delivery milestones; acceptance criteria.
P04	Centralised Monitoring Failure	Failure of remote telemetry, central monitoring or alarm aggregation for BESS/PV across sites.	Undetected faults; delayed response to thermal or electrical events.	3	5	15	Technical / Safety	Central monitoring architecture; redundancy and failover plan; alarm escalation matrix; monitoring SLA; test plan and acceptance criteria.
P05	Concurrent Critical Events	Simultaneous incidents at multiple sites (e.g., extreme weather, flood, wildfire) that overwhelm response capacity.	Widespread outages; inability to respond; reputational and clinical risk.	2	5	10	Resilience / Emergency	Multi-site emergency response plan; mutual aid agreements; surge resourcing plan; prioritisation matrix; insurance and contingency funding arrangements.

13. Risk Register

13.1. Methodology

- **Raw Risk** is calculated as $L \times S$ before controls.
- **Residual Risk** is calculated as $L_r \times S_r$ after the minimum client controls are applied.
- The Principal Contractor must complete the HIRA by: (a) confirming acceptance of the minimum controls, (b) adding any additional controls they will implement, (c) scoring **PC Residual L** and **PC Residual S**, and (d) uploading evidence files referenced in the **Evidence Required** column.
- **Action thresholds:** Raw or Residual scores ≥ 11 are High or Critical and require immediate supervision or stop-work until controls are verified.

14. Risk Register

Risk ID	Risk Title	Description	Potential Impact	L (1-5)	S (1-5)	Raw (LxS)	Risk Category	Existing Controls (High level)	Required Action (Client expectation)	Owner	Review Frequency
R01	PSA Oxygen Supply Interruption	Works, damage or commissioning error causes partial/complete loss or contamination of hospital PSA oxygen	Patient harm; clinical escalation; legal exposure	2	5	10	Clinical / Operational	Hospital approvals; isolation SOPs; DBSA Engineer oversight	Mandatory written approvals for any PSA work; pre-works verification; redundant supply checks; emergency response drill	Hospital Engineering / DBSA appointed Engineer	Weekly during works; immediate pre-works
R02	BESS Thermal Runaway	Battery cell/module thermal event propagates causing fire, toxic	Evacuation; facility loss; patient risk	3	5	15	Safety / Technical	OEM TRP, BMS, ventilation requirements (baseline)	Require OEM TRP evidence; BTRRP integrated with ERP; FAT/SAT	PC Project Manager; BESS OEM Rep	Prior to first charge; monthly during commissioning

Risk ID	Risk Title	Description	Potential Impact	L (1-5)	S (1-5)	Raw (LxS)	Risk Category	Existing Controls (High level)	Required Action (Client expectation)	Owner	Review Frequency
		gas and facility damage							witness; energisation PTW		
R03	PV / DC Electrical Incident	DC string faults, arc flash or incorrect isolation during installation/commissioning	Severe burns; fire; equipment damage	3	4	12	Safety / Electrical	Registered electricians; LOTO baseline; electrical standards	Enforce SANS/IEC compliance; arc-flash study; LOTO verification; energisation PTW	Registered Electrician; CHSO	Daily during electrical works
R04	Excavation / Service Strike	Striking underground services (power, oxygen)	Service outages; explosion; structural damage	4	4	16	Civil / Safety	Wayleave checks; CAT/GPR recommended	Mandatory utility verification; hand-digging near services; excavation permit;	Excavation Supervisor; TWD	Daily for excavation activities

Risk ID	Risk Title	Description	Potential Impact	L (1-5)	S (1-5)	Raw (LxS)	Risk Category	Existing Controls (High level)	Required Action (Client expectation)	Owner	Review Frequency
		reticulation) during civil works							TWD shoring design		
R05	Lifting / Crane Impact on Hospital Access	Crane/lift incident blocks ambulance routes or drops load near patient access	Fatality; critical access loss; reputational damage	3	5	15	Logistics / Safety	Lift plans; TMP baseline	Require detailed lift plans, ground tests, exclusion zones; DBSA structural sign-off; schedule to avoid peak patient movements	Lifting Supervisor; Site Traffic Coordinator	Per lift; pre-lift approval
R06	Critical Path Delay / Programme Overrun	Delays in deliveries, approvals or works	Increased cost; delayed benefits;	3	4	12	Commercial / Programme	Baseline programme;	Client to require detailed programme, contingency,	PC Project Manager	Weekly reporting

Risk ID	Risk Title	Description	Potential Impact	L (1-5)	S (1-5)	Raw (LxS)	Risk Category	Existing Controls (High level)	Required Action (Client expectation)	Owner	Review Frequency
		causing schedule slippage	contractual claims					procurement plans	milestone KPIs and monthly reporting		
R07	Supply Chain / OEM Non-conformance	Late delivery, non-compliant equipment or missing OEM safety data	Commissioning delays; safety non-compliance	3	4	12	Commercial / Technical	Tender returnables require OEM data	Require OEM SDS, TRP, commissioning procedures with tender; hold mobilisation until evidence provided	Procurement Lead; PC	At tender evaluation and pre-mobilisation
R08	Environmental Event — Flooding / Stormwater	Heavy rains cause site flooding, trench collapse or equipment damage	Work stoppage; equipment	3	4	12	Environmental / Safety	Stormwater plan baseline	Require site stormwater management, temporary	Environmental Officer; Site Manager	Daily weather checks; pre-works season planning

Risk ID	Risk Title	Description	Potential Impact	L (1-5)	S (1-5)	Raw (LxS)	Risk Category	Existing Controls (High level)	Required Action (Client expectation)	Owner	Review Frequency
			loss; safety risk						drainage and stop-work criteria		
R09	Environmental Event — Wildfire / Bushfire	Dry season wildfire threatens site or hospital perimeter	Evacuation; asset loss; patient risk	2	5	10	Environmental / Safety	Wildfire contingency recommended	Require wildfire contingency, vegetation clearance and liaison with local fire services	Environmental Officer; Fire Safety Officer	Seasonal (pre-dry season)
R10	Infection Control / Clinical Contamination	Dust, fumes or vectors from works affect clinical areas	Patient infection risk; clinical service disruption	3	4	12	Clinical / Environmental	Dust suppression baseline	Require infection control sign-off, dust monitoring and mitigation,	Environmental Officer; Hospital Infection Control	Daily when adjacent to clinical areas

Risk ID	Risk Title	Description	Potential Impact	L (1-5)	S (1-5)	Raw (LxS)	Risk Category	Existing Controls (High level)	Required Action (Client expectation)	Owner	Review Frequency
									restricted access near clinical zones		
R11	Security — Theft / Vandalism	Theft or vandalism of batteries, inverters or site plant	Financial loss; project delay; safety hazards	3	3	9	Security / Commercial	Site security baseline	Require secure compound, CCTV, asset tagging and night security plan	PC Site Security	Daily security checks
R12	Community Relations / Public Disruption	Community unrest or complaints leading to protests or access blockages	Work stoppage; reputational damage; safety risk	3	4	12	Social / Reputational	Community liaison recommended	Require community liaison plan, public notices and single point of contact	Community Liaison Officer; PC	Weekly during mobilisation and major works

Risk ID	Risk Title	Description	Potential Impact	L (1-5)	S (1-5)	Raw (LxS)	Risk Category	Existing Controls (High level)	Required Action (Client expectation)	Owner	Review Frequency
R13	Traffic / Emergency Access Interruption	Deliveries or crane movements obstruct emergency vehicle access	Patient transfer delays; legal exposure	3	5	15	Logistics / Safety	TMP baseline	Enforce TMP, maintain emergency corridor, pre-notify hospital of major movements	Site Traffic Coordinator; PC	Per movement; daily coordination
R14	Regulatory / Permitting Non-compliance	Missing construction permits, COCs or statutory approvals	Stop work orders; fines; reputational damage	2	5	10	Legal / Compliance	Client requires permits in H&S File	Require PCs to submit permits with tender and premobilisation; Client verification before mobilisation	PC; Client Representative	Pre-mobilisation and monthly audit

Risk ID	Risk Title	Description	Potential Impact	L (1-5)	S (1-5)	Raw (LxS)	Risk Category	Existing Controls (High level)	Required Action (Client expectation)	Owner	Review Frequency
R15	Workforce Competence / Availability	Lack of competent electricians, riggers or OEM reps on site	Unsafe works; delays; non-compliance	3	4	12	Human Resources / Safety	Tender CVs and LOAs required	Require competency evidence, LOAs, SACPCMP where applicable; contingency staffing plan	PC HR; CHSO/CHS M (if applicable)	Weekly during mobilisation
R16	Financial / Cost Overrun	Unforeseen costs (remediation, delays, rework) exceed budget	Funding shortfall; contract disputes	2	4	8	Commercial / Financial	Budget contingency recommended	Require cost contingency, change control and monthly cost reporting	PC Commercial Manager; Client PM	Monthly financial review

Risk ID	Risk Title	Description	Potential Impact	L (1-5)	S (1-5)	Raw (LxS)	Risk Category	Existing Controls (High level)	Required Action (Client expectation)	Owner	Review Frequency
R17	Reputational / Stakeholder Escalation	Adverse media, patient harm or stakeholder complaints	Loss of trust; funding/contract risk	2	5	10	Reputational	Communications plan recommended	Require stakeholder communications plan, incident escalation protocol and media handling	Client Communications; PC	As required; monthly review
R18	Health & Safety Incident (Major)	Major accident (fall, electrocution, collapse) on site	Fatality; prosecution; stop work	2	5	10	Safety / Legal	PTW, SWMS baseline	Require immediate stop-work authority, incident investigation protocol, statutory notifications	PC; CHSM (if applicable); PrCHSA	Immediate; post-incident review

15. Monitoring and Review Procedures

15.1. Monitoring frequency

- **Daily:** Prestart checks, PTW compliance, LOTO register updates, daily inspections for excavations and temporary works.
- **Weekly:** Site inspections, toolbox talks, dust/noise monitoring summaries, permit compliance checks.
- **Monthly:** Formal audits by CHSO/CHSM (if applicable) and PrCHSA; KPI reporting (TRIR, LTIFR, permit compliance, corrective action close-out).
- **Before critical events:** DBSA appointees to witness FAT/SAT, energisation and first charge events; pre-energisation audits required.

15.2. Review triggers

- Incident or near miss; change in scope; introduction of new equipment or subcontractor; failed audit; weather events; hospital escalation.

15.3. Programme Monitoring and Maintenance Reporting

- Weekly programme coordination meetings (DBSA, NDoH, PC leads) during mobilisation and critical phases.
- Monthly consolidated H&S KPI reporting across all sites to DBSA and NDoH.
- Quarterly programme risk reviews and SLA performance reviews during the 36-month maintenance period.

16. Recordkeeping

All monitoring records, permits, LOTO certificates, FAT/SAT witness statements, audit reports and corrective action trackers must be retained in the site H&S File and submitted to the Client on request.

17. Responsibilities

- **DBSA Programme Manager:** overall programme coordination and verification of multi-site delivery and maintenance performance.
- **Principal Contractor:** Implement monitoring regime, maintain registers, close out corrective actions, submit monthly KPIs.

- **PC / Maintenance Contractor:** responsible for central monitoring, spare parts logistics and meeting SLA obligations for 36 months.
- **CHSM (if applicable)/ CHSO:** Conduct daily/weekly inspections, maintain PTW and LOTO registers, coordinate with hospital engineering.
- **PrCHSA / DBSA Appointees:** Conduct independent audits, witness critical tests, accept PHSP and H&S File.
- **Hospital Engineering:** Provide approvals for works affecting PSA or critical services and participate in emergency drills.

18. Control Measures (Hierarchy of Controls)

18.1. Hierarchy applied in order of preference:

1. **Elimination:** Avoid works that affect PSA during critical clinical windows; schedule high-risk activities outside patient transfer times.
2. **Substitution:** Use less hazardous materials or equipment where feasible (e.g., non-flammable cleaning agents).
3. **Engineering Controls:** BMS redundancy, ventilation for battery rooms, physical segregation, bunding for fuel, certified anchors and fall arrest systems, shoring for excavations.
4. **Administrative Controls:** PTW system, SWMS/RAMS, training and competence verification, traffic management plan, hospital coordination procedures, emergency response plans (including BTRRP).
5. **PPE:** Task-specific PPE (arc-flash PPE, hearing protection, respiratory protection, chemical suits, snake gaiters for clearing where required)

19. Minimum client expectations

All controls listed in the Baseline Risk Assessment Table are **mandatory minimums**; the Principal Contractor must demonstrate how they will meet or exceed these controls and provide evidence during tender evaluation and premobilisation

20. Annexure

20.1. Annexure A: Programme Risk Mitigation Template

Template for tenderers to complete mitigation plans for P01–P05 including owners, timelines, resources and KPIs

21. Final Notes and Tender Instructions

- **Tender returnables:** Completed PHSP; Master HIRA with PC residual scoring and evidence; SWMS/RAMS for all high-risk activities; signed appointment letters and CVs for mandatory roles; OEM TRP and battery safety data; FAT/SAT witness arrangements; TMP; EMP; BTRRP; LOTO procedures and templates. Failure to provide mandatory returnables will render the tender non-compliant.
- **PHSP acceptance:** PHSP must be submitted with the tender and accepted in writing prior to mobilisation. PHSP acceptance criteria are set out in Annexure A (PHSP Minimum Content Checklist).
- **Hospital coordination:** Any works affecting PSA oxygen plants, emergency power or medical gas systems require written approval from the hospital engineering team and DBSA appointed Engineer and must be scheduled outside critical clinical windows.
- **H&S File:** The PC must open and maintain the site H&S File and include all evidence required by this HIRA; the Client will evaluate the H&S File and may withhold mobilisation approval until acceptance criteria are met.

22. Principal Contractor Acknowledgement and Acceptance

Project: DBSA-NDoh-GF PSA OXYGEN PLANTS — Cluster 2 Hospital Projects

Scope

DBSA PSA Solar Backup Programme works at Cluster 2 Hospitals (Bela-Bela; Jubilee; Seshego; Mecklenburg; Lydenburg/Mashishing; Sabie; Tintswalo; Kwa-Mhlanga)

Acknowledgement

The undersigned Principal Contractor hereby acknowledges receipt of the **Project HIRA / Baseline Risk Assessment (BRA)** and the **Project Health, Safety & Risk Assessment** documentation issued by the Client. The Principal Contractor confirms that it has reviewed the documents, understands the Client's minimum health, safety, environmental and commissioning requirements, and accepts responsibility to implement, maintain and verify the controls and evidence requirements set out therein.

Scope of Acceptance

The Principal Contractor accepts responsibility to:

- Implement the **minimum controls** and permit systems specified in the Baseline Risk Assessment and Project HIRA.



- Prepare, submit and maintain the **Project Health & Safety Plan (PHSP)**, site H&S File and all mandatory RFQ returnables.
- Provide the SWMS/RAMS, PTW records, LOTO isolation certificates, OEM TRP and battery safety data, FAT/SAT witness arrangements and other evidence required for PHSP acceptance.
- Coordinate and obtain written approvals from hospital engineering for any works affecting PSA oxygen plants, emergency power or medical gas systems.
- Cooperate with DBSA-appointed professionals and comply with their reasonable instructions within their professional scope.

Documents Accepted as Baseline

- Project HIRA / Baseline Risk Assessment (this document)
- Risk Matrix and Risk Classification Methodology
- Baseline RAMS/SWMS / PTW matrix and minimum SWMS references
- BTRRP template and ERP integration requirements
- PHSP Minimum Content Checklist (Annexure A)

23. Principal Contractor Declaration

I confirm that the Principal Contractor will submit the completed PHSP, the completed HIRA with PC residual scoring and all mandatory tender returnables prior to mobilisation and will not commence any construction activity until PHSP acceptance and any required permits are in place.

Principal Contractor Details

Company name: _____

Company registration number: _____

Address: _____

Primary H&S Contact name: _____

Primary H&S Contact mobile: _____

Primary H&S Contact email: _____

Authorised Representative

Name: _____



Position: _____

Signature: _____

Date: _____

24. For Client Use Only

Client Representative name: _____

Signature: _____

Date: _____

PHSP Acceptance status: ☐ Accepted ☐ Accepted with conditions ☐ Not accepted

Conditions or comments: _____