



AIReSQ



IIT Gandhinagar



MCG MUNICIPAL CORPORATION GURUGRAM

GENERAL ARRANGEMENT PLAN | SCALE 1:400 AT A1 | ALL WORKS BURIED EXCEPT EDGE KIOSK KI-1



WGS 84 / UTM zone 43N (EPSG:32643) | North up | Coordinates in m | Levels in m on the model datum (survey datum tie pending)
Base: Esri World Imagery (desaturated). Imagery: Esri, Vantor, Earthstar Geographics and GIS User Community. Pond outline: simulated peak depth > 0.15 m before works.

KEY PLAN | 600 m MODEL AREA



LEGEND

- Ram Lila Ground, provisional visual boundary (not cadastral)
- Pond before works, simulated peak depth > 0.15 m
- Flush pond inlet grate 0.5 m²
- Inlet lateral to sump (schematic)
- DN700 main GM-1
- Buried storage: PP module field or RCC forebay
- Access riser / manhole, phase 1
- Buried plant room bays
- Plant pipe: DN500 link (solid), to wells (dashed)
- Injection well in flush vault
- Future phase (dashed grey): IW-3, IW-4, IG-1 + vents
- Recharge trench + 2 shafts (analytic)
- Edge kiosk, only above-ground unit
- Section mark, see FA-RL-02

SURFACE-USE ZONING | 1:1000



ZONE AREAS (FROM DRAWN GEOMETRY)

A PERMANENTLY UNUSABLE	30 m² 0.2%
Edge kiosk, gallery entry stair and hatch, vent stacks	
B KEEP CLEAR - NO FIXED STRUCTURES	1,058 m² 8.3%
Access and desilting hatches and risers with 3 m apron, wellhead vaults, maintenance route from the road	
C LOAD-LIMITED USE	2,508 m² 19.6%
Over storage fields, tanks, plant room and gallery: crowds, stage, light vehicles; no heavy cranes, piling or deep tent pegs	
D RECHARGE TRENCH STRIPS	236 m² 1.8%
Walkable turf; no vehicles	
E FULLY USABLE	8,937 m² 70.0%
Open ground, no restriction	
GROUND TOTAL 12,769 m² = 100%	

SCHEDULE OF WORKS (SIMULATED SIZES AND LEVELS; * ANALYTIC)

TAG	ITEM	SIZE	LEVELS (m)	CAPACITY	PHASE	CONSTRUCTION TYPE
IN-1.7	Pond inlet grates (7 no.)	0.5 m² each, Cd 0.62	GL 217.22-217.29	see FA-RL-04	1	Flush heel-proof grating on precast frame (load class to detailed design)
SP-1.7	Street pits with pumps (7 no.)	0.5 m² grate, 0.08-0.14 m³/s	GL 217.25-217.75	see FA-RL-06	1	
SU-1	Collector sump	10 m³ x 1.5 m	floor 215.74	15 m³	1	Precast RCC chamber, flush lockable cover
PM-1	Pond booster on main	12 m³/s free, 3 m lift		52 kW limit	1	Submersible pump in sump
GM-1	Gravity/booster main	DN700, L 15.7 m	IL 215.74-215.64	1.04 m³/s	1	DN700 pressure pipe (PE100 or DI, to detailed design)
FB-1	Forebay + hydrodynamic separator	10 x 10 x 2 m	213.94 / 215.94	200 m³	1	Forebay + hydrodynamic separator, precast RCC, desiltable
SF-1.2	Storage fields, PP column-and-deck modules	42 x 25.2 m each, ~4 m deep	211.94 / 215.94	2 x 4,000 m³	1	PP column-and-deck modules, geomembrane-wrapped, >= 0.8 m cover, inspection rows
TP-1.2	Treatment pumps	25 L/s each, 12 m	intake 212.04	2 x 3 kW	1	In plant room PR-1
FS-1	Filter skid	20 m³ media	feed 214.44-216.44	50 L/s	1	In plant room PR-1
CT-1	Clean tank (buried)	25 x 10 x 4 m	210.44 / 214.44	1,000 m³	1	PP column-and-deck modules, geomembrane-wrapped, >= 0.8 m cover, inspection rows
IB-1	Injection booster	0.1 m³/s, 10 m		15 kW	1	In plant room PR-1
IW-1.4	Injection wells, deep	DIA 0.5 m, 20 m apart	screen 87.55-67.55	see FA-RL-02	1 (IW-1, 2); future (IW-3, 4)	Cased deep well, screen at depth; flush lockable wellhead vault
OW-1.2	Observation piezometers	passive			1	Piezometer in flush lockable vault
RT-1.4	Recharge trench + 2 shafts	30 x 2 x 3 m, shafts 1.2 x 9 m	GL -217.2-217.3	~13 L/s each	1	Geotextile-wrapped gravel (alt. infiltration crates); turf over
PR-1a.d	Buried plant room, bays a-d (filter, controls, pumps, waste)	188 m² in 4 bays	floor ~4.5 m below GL	TP, FS, IB, controls	1	Precast RCC box, buried
IG-1	Inspection gallery (walk-through)	DIA 2.4 m pipe, 161 m	floor 210.50	access only	future	2.4 m corrugated HDPE pipe
OC-1 + FG-1	Overflow chamber + flap gate	2.6 x 2.6 m; DN800 gate	weir 215.49; floor 214.40	closed in design storm	1	Precast RCC chamber, fixed weir, DN800 flap gate (closed in design storm)
OF-1	Overflow outfall to trunk drain	DN800, 45 m	IL 214.70, 1200	gravity, post-storm	1	DN800 RCC NP3 gravity pipe to MCG trunk drain (to confirm)
KI-1	Edge kiosk + gallery entry	4 x 3 m; stair + 1.5 x 1.5 m hatch	GL		1 (stair, hatch future)	Prefabricated kiosk on plinth

NOTES

- All units, levels and capacities are those simulated in the FloodAstra with-works simulation of 18 Oct 2026 unless marked *. RT trenches are an analytic proposal, NOT simulated.
- Ram Lila Ground boundary is a provisional visual envelope (not cadastral). Utilities, trees, access, setbacks and structural design are not surveyed.
- Inlet laterals to the sump are shown schematic; their head losses were not modelled (each grate is an orifice into the shared sump).
- Plant links centre-to-centre as modelled; forebay links 2 x DN500. Street pits: FA-RL-06.
- Aquifer layers are regional numerical priors, not bore logs. Confirm by test bore and injection test.
- The 1 m terrain model used for this simulation contains about 1,230 m² of obstacles inside the ground that do not exist on site; simulated pond extent is therefore slightly conservative.
- Inspection gallery IG-1, kiosk entry, vents and surface-use zones are access and structural provisions only; they are not part of the hydraulic simulation. Gallery kept >= 3 m clear of every well casing (minimum 4.6 m).
- Phasing: phase 1 = all units except IW-3, IW-4 and gallery IG-1 (future phase, shown dashed grey). In phase 1 the storage fields, clean tank, forebay, sump and plant room are reached by the access risers / manholes shown; surface-use zones are for full build-out.
- Imagery date unverified (mosaic may contain several dates); used for context only. Levels are on the model datum; survey datum tie pending.

PROJECT / CLIENT

Ram Lila Ground, Sheetha Mata Mandir Road, Gurugram

Client: Municipal Corporation of Gurugram

Prepared by: IIT Gandhinagar with AIReSQ

WHAT THIS SHEET SHOWS

GENERAL ARRANGEMENT OF ALL PROPOSED UNITS WITH SCHEDULE OF WORKS, SURFACE-USE ZONING AND NOTES

FLOODASTRA GURUGRAM | GENERAL ARRANGEMENT

DWG No. FA-RL-01 | SHEET 1 OF 7

REV P3 | 18 OCT 2026 | STREET CAPTURE, PUMPING AND I&C

Scale 1:400 (plan) | Sheet A1 | Levels: m

PROPOSED DESIGN - PRELIMINARY - NOT FOR CONSTRUCTION



AIReSQ



IIT Gandhinagar



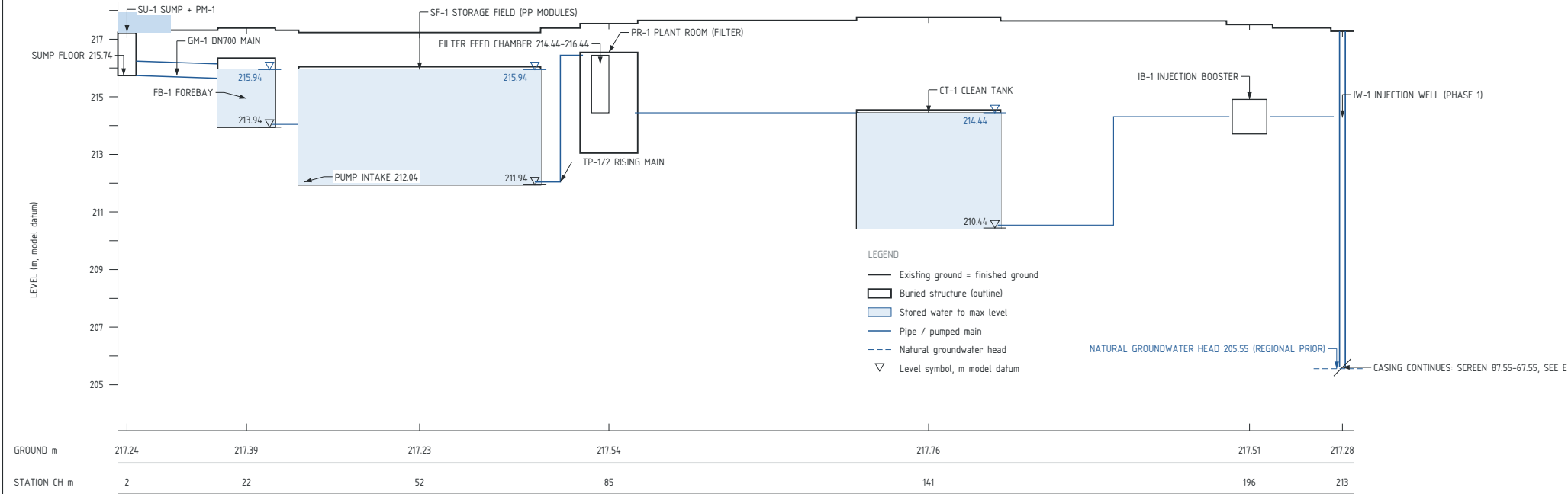
MUNICIPAL CORPORATION OF GURUGRAM
NURTURING GURUGRAM

A DEVELOPED HYDRAULIC LONG SECTION | H 1:500 V 1:100 AT A1 | VERTICAL EXAGGERATION 5x

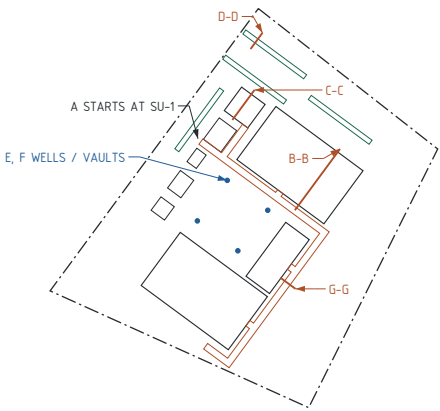
Developed along the flow path inlet - sump - main - forebay - storage field - plant room - clean tank - booster - well; units at true internal length.

Pond peak before works 217.94 m (0.70 m over IN-1 grate 217.24); main GM-1 invert 215.74 at sump to 215.64 at forebay port; forebay outlet to cells 214.04.

SIMULATED (results at 3.2 h from rain start): PEAK INFLOW 1.06 m³/s; TAKEN OFF GROUND 7,366 m³; FILTERED 364 m³; TO WELLS 339 m³; INTO AQUIFER 330 m³



SECTION LOCATIONS | 1:1500 (SEE FA-RL-01)

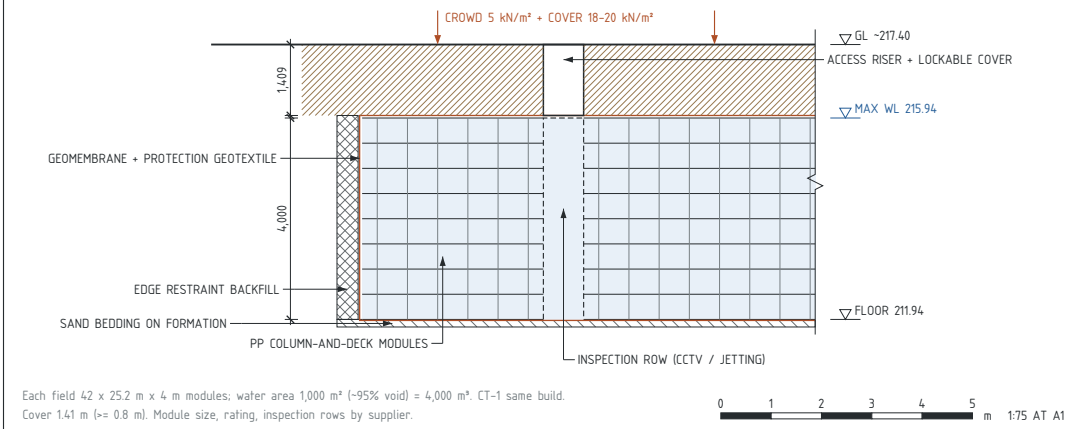


DESIGN LOADS ON BURIED ROOFS AND DECKS

LOAD CASE	VALUE
Soil and turf cover ~1 m	18-20 kN/m²
Crowd, assembly area (IS 875 Part 2)	5 kN/m²
Stage / light vehicles	local check through cover
Typical design total	~25-30 kN/m²
Module rating, column spacing	to detailed design

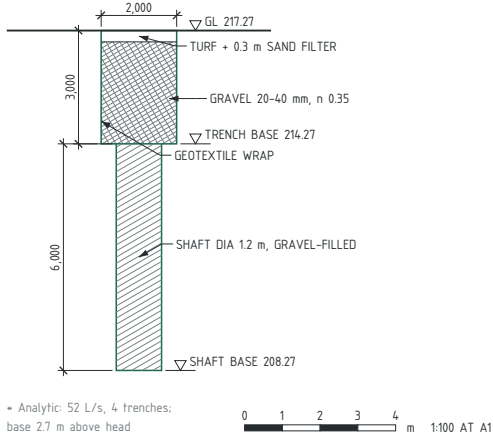
Load path: turf and cover - module deck - module columns - bedding - ground (PP fields), RCC roof - walls - base (forebay, plant room). No heavy cranes or piling over buried units.

SECTION B-B | STORAGE FIELDS SF-1 / SF-2, PP COLUMN-AND-DECK MODULES (TYPICAL) | 1:75



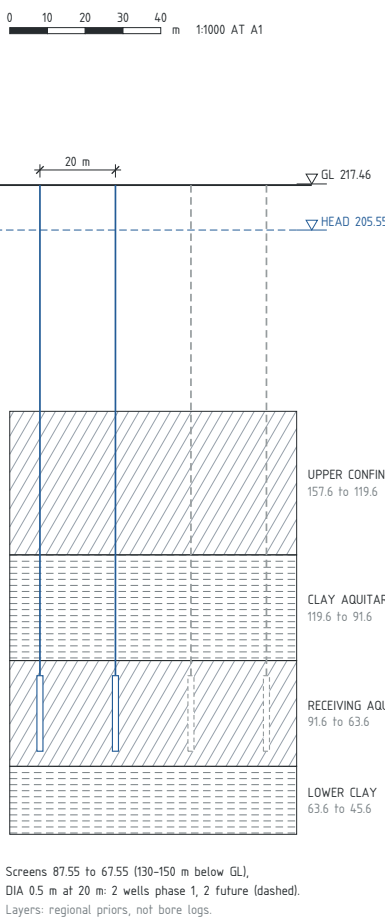
Each field 42 x 25.2 m x 4 m modules; water area 1,000 m² (~95% void) = 4,000 m³. CT-1 same build. Cover 1.41 m (b= 0.8 m). Module size, rating, inspection rows by supplier.

SECTION D-D | RECHARGE TRENCH + SHAFT* | 1:100

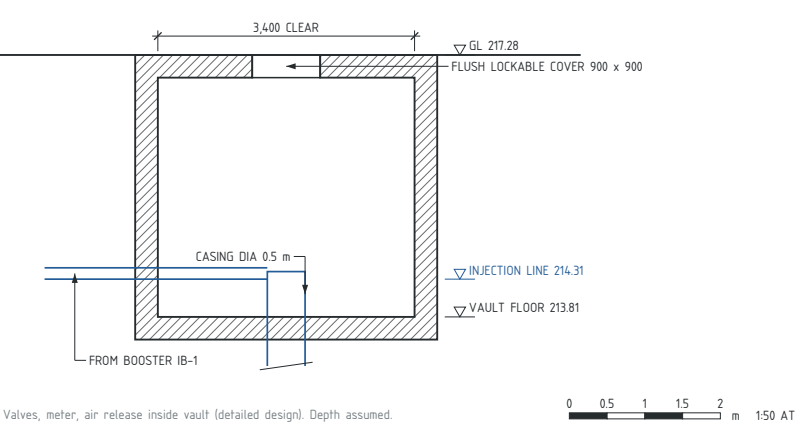


* Analytic: 52 L/s, 4 trenches; base 2.7 m above head

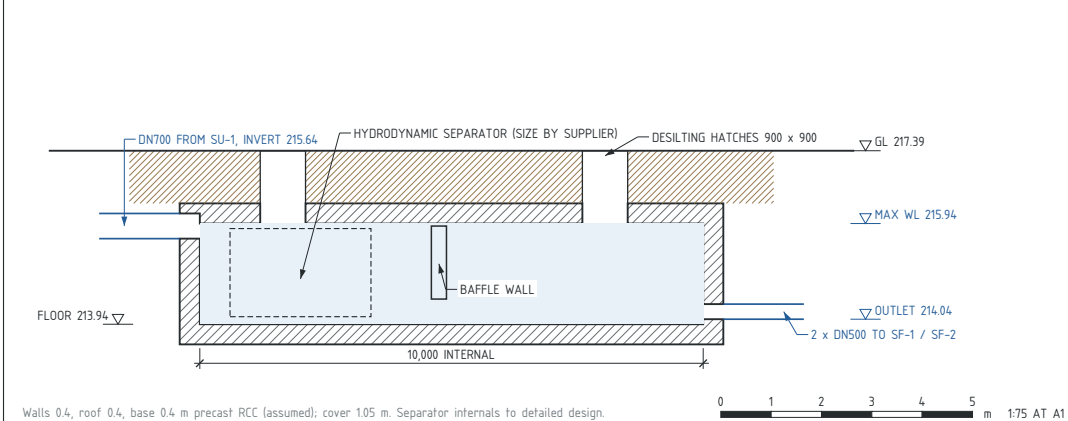
DETAIL E | INJECTION WELLS VS AQUIFER | 1:1000



DETAIL F | WELLHEAD VAULT (IW-1.4) | 1:50

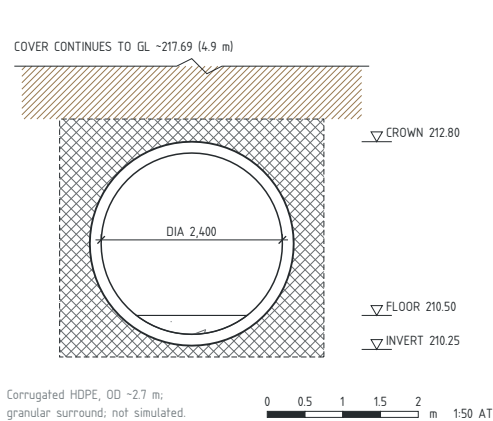


SECTION C-C | FOREBAY FB-1 + HYDRODYNAMIC SEPARATOR, PRECAST RCC | 1:75



Walls 0.4, roof 0.4, base 0.4 m precast RCC (assumed); cover 1.05 m. Separator internals to detailed design.

SECTION G-G | GALLERY IG-1 (FUTURE) | 1:50



Corrugated HDPE, OD ~2.7 m; granular surround; not simulated.

MATERIALS AND CONSTRUCTION NOTES

- Construction type per unit: SF-1, SF-2 and CT-1 polypropylene (PP) column-and-deck modules (~95% void), geomembrane-wrapped, >= 0.8 m cover, inspection rows and access risers; FB-1 forebay + hydrodynamic separator, precast RCC, desiltable; PR-1 precast RCC box; IG-1 2.4 m corrugated HDPE pipe; RT geotextile-wrapped gravel (alt. infiltration crates).
- RCC (FB-1, PR-1, SU-1): M30 minimum, water-retaining design to IS 3370 and IS 456; clear cover 45 mm water faces, 50 mm earth faces; waterstops.
- Geomembrane HDPE with protection geotextile both sides; separation geotextile non-woven. Gravel 20-40 mm washed, porosity ~0.35.
- Backfill: selected granular, compacted in layers; sand bedding under modules; check flotation of empty units against groundwater.
- CT-1 storage 1,000 m³ is simulated as open volume; at ~95% void the module block needs ~1,053 m³ gross (detailed design).
- Material choice does not change the simulated hydraulics: geometry and levels are as simulated.

PROJECT / CLIENT

Ram Lila Ground, Sheetha Mata Mandir Road, Gurugram

Client: Municipal Corporation of Gurugram

Prepared by: IIT Gandhinagar with AIReSQ

WHAT THIS SHEET SHOWS

DEVELOPED HYDRAULIC LONG SECTION INLET TO WELL, TYPICAL SECTIONS AND DETAILS, DESIGN LOADS AND MATERIALS

FLOODASTRA GURUGRAM | SECTIONS AND DETAILS

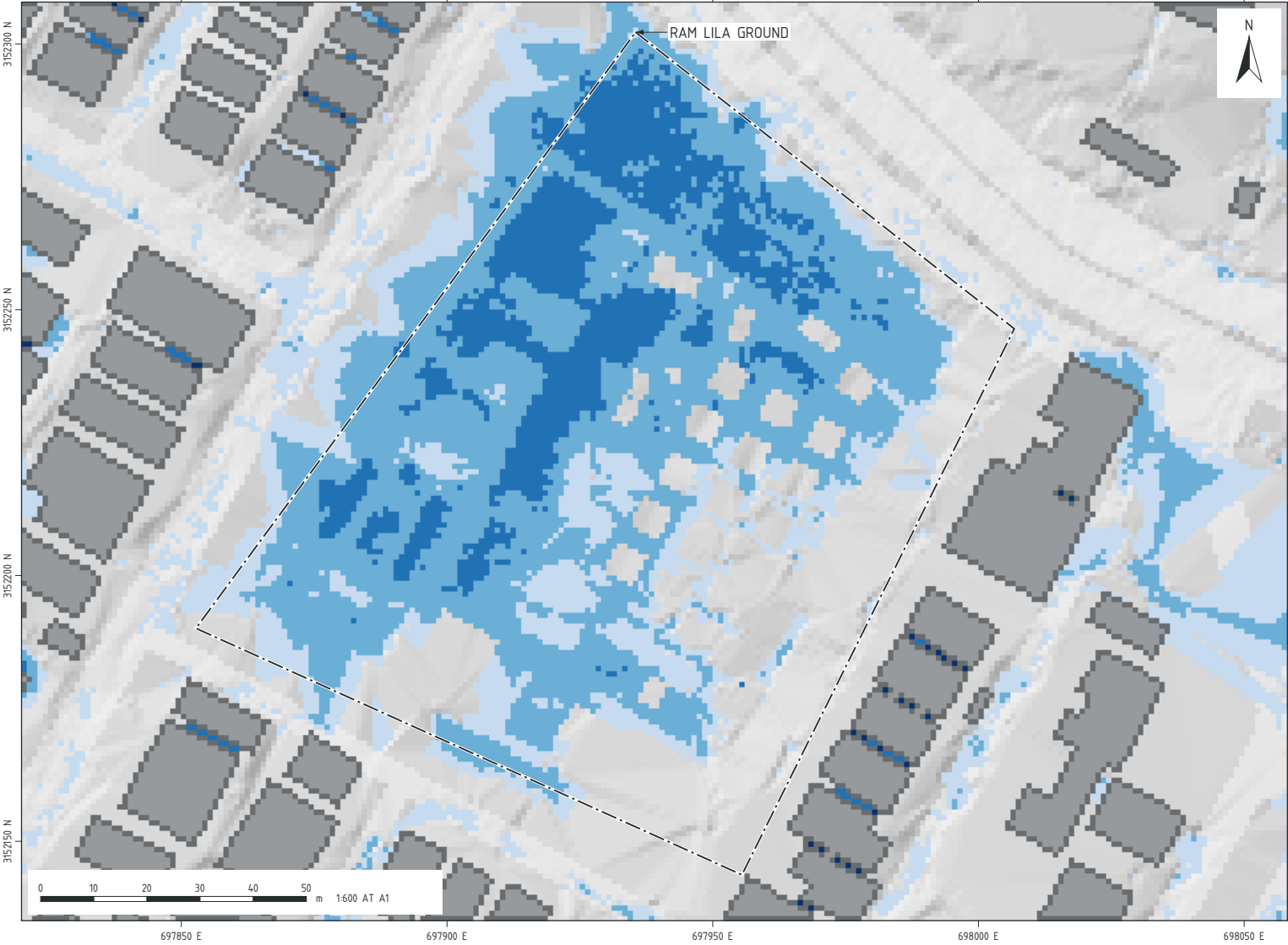
DWG No. FA-RL-02 | SHEET 2 OF 7

REV P3 | 18 OCT 2026 | STREET CAPTURE, PUMPING AND I&C

Scales stated in views | Sheet A1 | Levels: m

PROPOSED DESIGN - PRELIMINARY - NOT FOR CONSTRUCTION

BEFORE WORKS | NO WORKS



WGS 84 / UTM zone 43N (EPSG:32643) | North up | Coordinates in m | Base: FloodAstra 1 m terrain model (2026), hillshade: existing buildings grey; roads light

KEY PERFORMANCE INDICATORS | WITH THE SCHEME VS NO WORKS, RESULTS AT 3.2 H FROM RAIN START (RAIN 0-3 H)

73.7 lakh L

Water removed from the ground
7,366 m³ in 0-3.2 h

-76%

Water above 0.15 m on the ground at 3.2 h
2,878 to 703 m³

-44%

Ground area still above 0.15 m at 3.2 h
9,185 to 5,143 m²

4,207 m³

Captured from nearby streets
7 pumped street pits, 0-3.2 h

0.91 to 0.72 m

Maximum depth on the ground
~21% peak occurs during the rain

76%

Buried storage in use at 3.2 h
7,022 of 9,205 m³

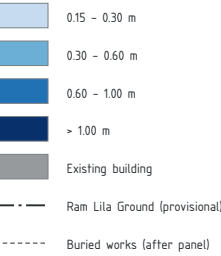
330 m³

Recharged to the deep aquifer
in 0-3.2 h; stored water follows in ~39 h at 50 L/s

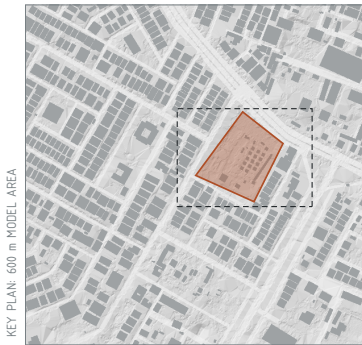
1.06 m³/s

Peak intake to the plant
5-min mean, 14 grates

PEAK DEPTH ABOVE GROUND



Depths below 0.15 m not shown.



FLOODING SUMMARY | RESULTS AT 3.2 h FROM RAIN START (RAIN 0-3 h)

MEASURE	BEFORE	AFTER	CHANGE
Ram Lila Ground: area with peak depth > 0.15 m (m²)	9,186	5,209	-3,977 (-43%)
Ram Lila Ground: maximum depth (m)	0.91	0.72	-0.19 (-21%)
Ram Lila Ground: water above 0.15 m at 3.2 h (m³)	2,878	703	-2,175 (-76%)
Ram Lila Ground: area still > 0.15 m at 3.2 h (m²)	9,185	5,143	-4,042 (-44%)
Plant site (forebay): peak depth (m)	0.76	0.46	-0.30 (-39%)
600 m model area: area with peak depth > 0.15 m (m²)	93,373	80,775	-12,598 (-13%)
600 m model area: water above 0.15 m at 3.2 h (m³)	20,830	15,257	-5,572 (-27%)

NOTES

- BEFORE = simulation without works; AFTER = simulation with works. Both runs compared at about 3.2 h from rain start (3 h 14 min without works, 3 h 15 min with works). Same rain, terrain and empty start.
- Peak depth is the tracked maximum per original 1 m pixel over the run, not the final depth. 0.15 m is the field-reportable ponding threshold.
- The 600 m model box has no outflow or infiltration: all rain stays on the surface unless captured. Real drains would reduce both cases.
- Differences under 2 cm or 5% are within numerical noise and are not claimed as benefit.
- The 1 m terrain model used for this simulation contains about 1,230 m² of obstacles inside the ground that do not exist on site; simulated pond extent is therefore slightly conservative. Their cells appear unshaded inside the ground on the before map.

PROJECT / CLIENT

Ram Lila Ground, Sheetla Mata Mandir Road, Gurugram
Client: Municipal Corporation of Gurugram
Prepared by: IIT Gandhinagar with AIReSQ

WHAT THIS SHEET SHOWS

SIMULATED PEAK FLOOD DEPTH OVER THE FIRST 3.2 H FROM RAIN START WITHOUT AND WITH THE WORKS, SAME SCALE AND DEPTH

CLASSES

FLOODASTRA GURUGRAM | FLOOD DEPTH COMPARISON

DWG No. FA-RL-03 | SHEET 3 OF 7
REV P3 | 18 OCT 2026 | STREET CAPTURE, PUMPING AND I&C
Scale 1:600 (maps) | Sheet A1 | Levels: m
PROPOSED DESIGN - PRELIMINARY - NOT FOR CONSTRUCTION



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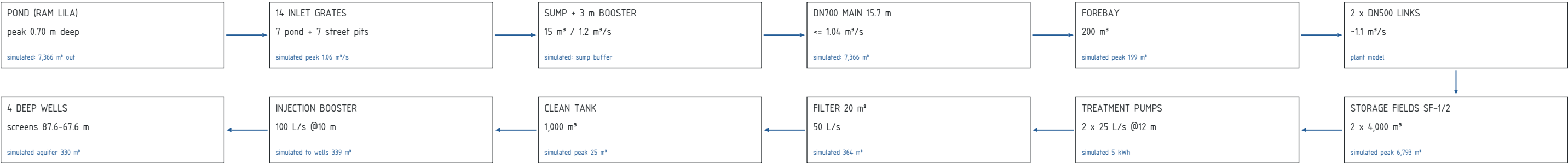
IIT Gandhinagar



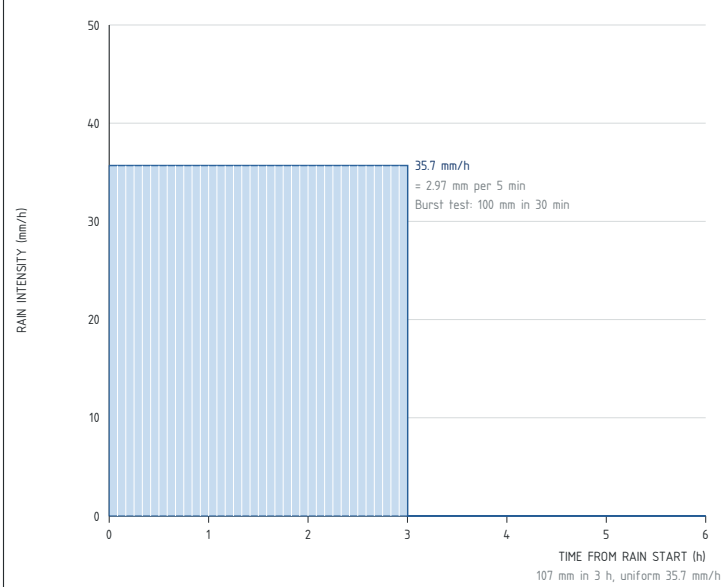
MUNICIPAL CORPORATION OF GURUGRAM

NURTURING GURUGRAM

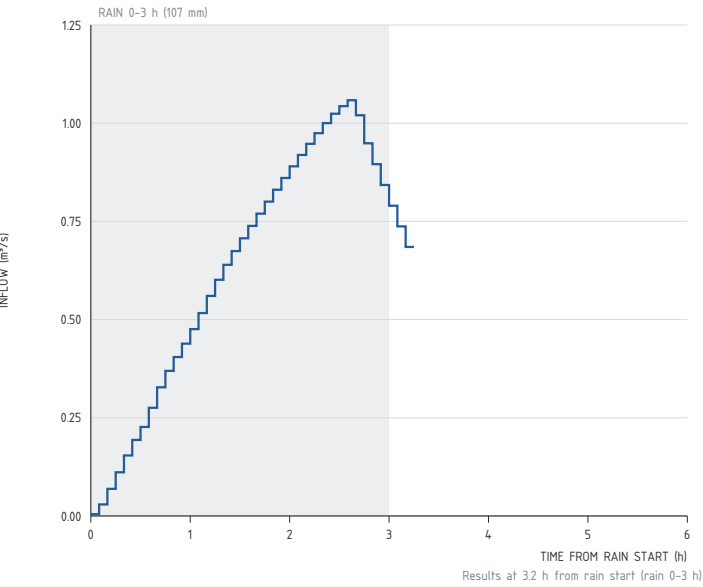
FLOW CHAIN WITH CAPACITY OF EACH STEP (DIAGRAM, NOT TO SCALE) | BLUE = SIMULATED | RESULTS AT 3.2 h FROM RAIN START (RAIN 0-3 h)



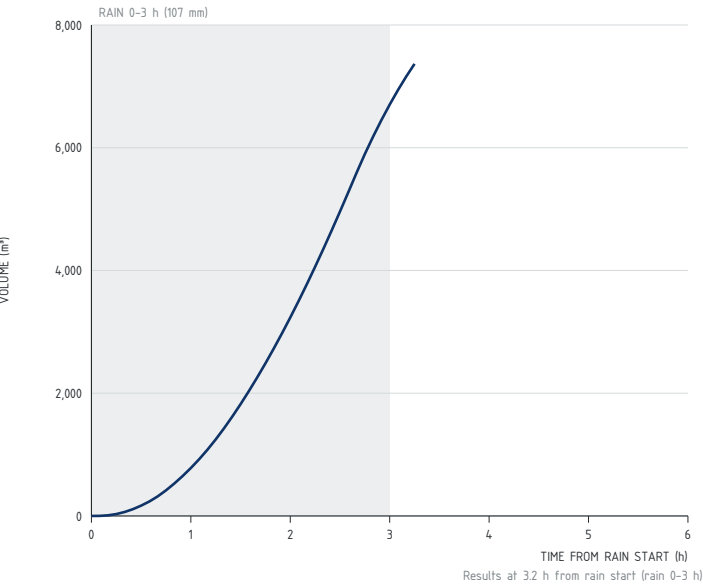
DESIGN STORM HYETOGRAPH (5-MIN)



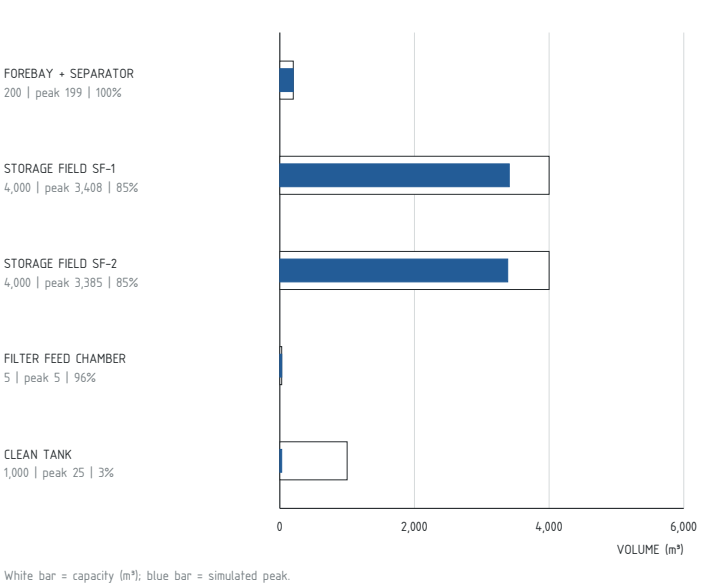
INFLOW TO SUMP (SIMULATED 5-MIN MEANS)



CUMULATIVE WATER TAKEN OFF THE GROUND



STORAGE CAPACITY VS SIMULATED PEAK FILL



EVENT WATER BALANCE (MODEL-COUNTED) | RESULTS AT 3.2 h FROM RAIN START (RAIN 0-3 h)

ACCOUNT, 0-3.2 h FROM RAIN START		m³	LITRES
Rain on 600 m x 600 m model area (107 mm)		38,520	38,520,000
Water taken off the ground by the 7 pond inlets and 7 street pits		7,366	7,366,394
Accepted into the plant (forebay)		7,360	7,360,335
of which held in forebay + storage fields + clean tank at end		7,022	7,021,682
of which filtered (treated)		364	363,654
of which pumped to injection wells		339	338,654
of which entered the deep aquifer through screens		330	330,242
Electricity: inlet booster (counted)		17.8 kWh	
Electricity: treatment pumps / injection booster		5.0 / 10.8 kWh	
Recharge trenches RT-1.4 (ANALYTIC, not in model)		-1,190	1,190,000

UNIT	GEOMETRY	CAPACITY m³	PEAK m³	END m³	% FULL
FOREBAY + SEPARATOR	10 x 10 x 2 m buried	200	199	199	100%
STORAGE FIELD SF-1	42 x 25.2 x 4 m PP modules	4,000	3,408	3,408	85%
STORAGE FIELD SF-2	42 x 25.2 x 4 m PP modules	4,000	3,385	3,385	85%
FILTER FEED CHAMBER	1 x 2.5 x 2 m in filter skid	5	5	5	96%
CLEAN TANK	25 x 10 x 4 m buried	1,000	25	25	3%
TOTAL PLANT STORAGE		9,205		7,022	

RATE LIMITS IN THE CHAIN

STEP	LIMIT	BASIS
Pond inlets: 7 grates 0.5 m² (per-inlet numerical cap ~ cell water / 5 s step)	1.06 m³/s peak	simulated
DN700 main with 3 m booster	1.04 m³/s max	pump curve ceiling (model)
Forebay to storage fields, 2 x DN500	~1.1 m³/s	plant hydraulics
Treatment pumps 2 x 25 L/s @12 m	0.05 m³/s	controls
Filter (20 m²)	0.05 m³/s	controls: limits well supply
Injection booster 10 m to 4 wells	0.10 m³/s	controls
Deep wells, 4 x DIA 0.5 m, 20 m screens	0.028 m³/s mean	simulated (aquifer priors)
Recharge trenches RT-1.4	~0.05 m³/s	analytic, verify by test

NOTES

- Water balance closes per 5 s step to < 0.000001 m³ (water) and < 0.000001 kg (sediment) across surface, sump, pipe, tanks, wells and aquifer.
- One crore litres = 10,000 m³. Plant storage is 9,205 m³ (92 lakh L). With 7 street pits the intake runs close to the DN700 main limit (~1.04 m³/s); at 3.2 h the plant holds 7,022 m³ (76% of capacity).
- To pass 48-96 L/s into the wells, filter and treatment capacity must be raised from 50 L/s; well acceptance itself (~15-20 L/s per well) is an aquifer-prior estimate to confirm by injection test.
- Stored water is treated and injected over the following days; storage fields must be drawn down before the next storm to give the same benefit.
- Trench figures are analytic (k = 2e-5 m/s, 5 L/s per shaft, gravel porosity 0.35) and were not part of the simulation.

PROJECT / CLIENT

Ram Lila Ground, Sheeta Mata Mandir Road, Gurugram
Client: Municipal Corporation of Gurugram
Prepared by: IIT Gandhinagar with AIReSQ

WHAT THIS SHEET SHOWS

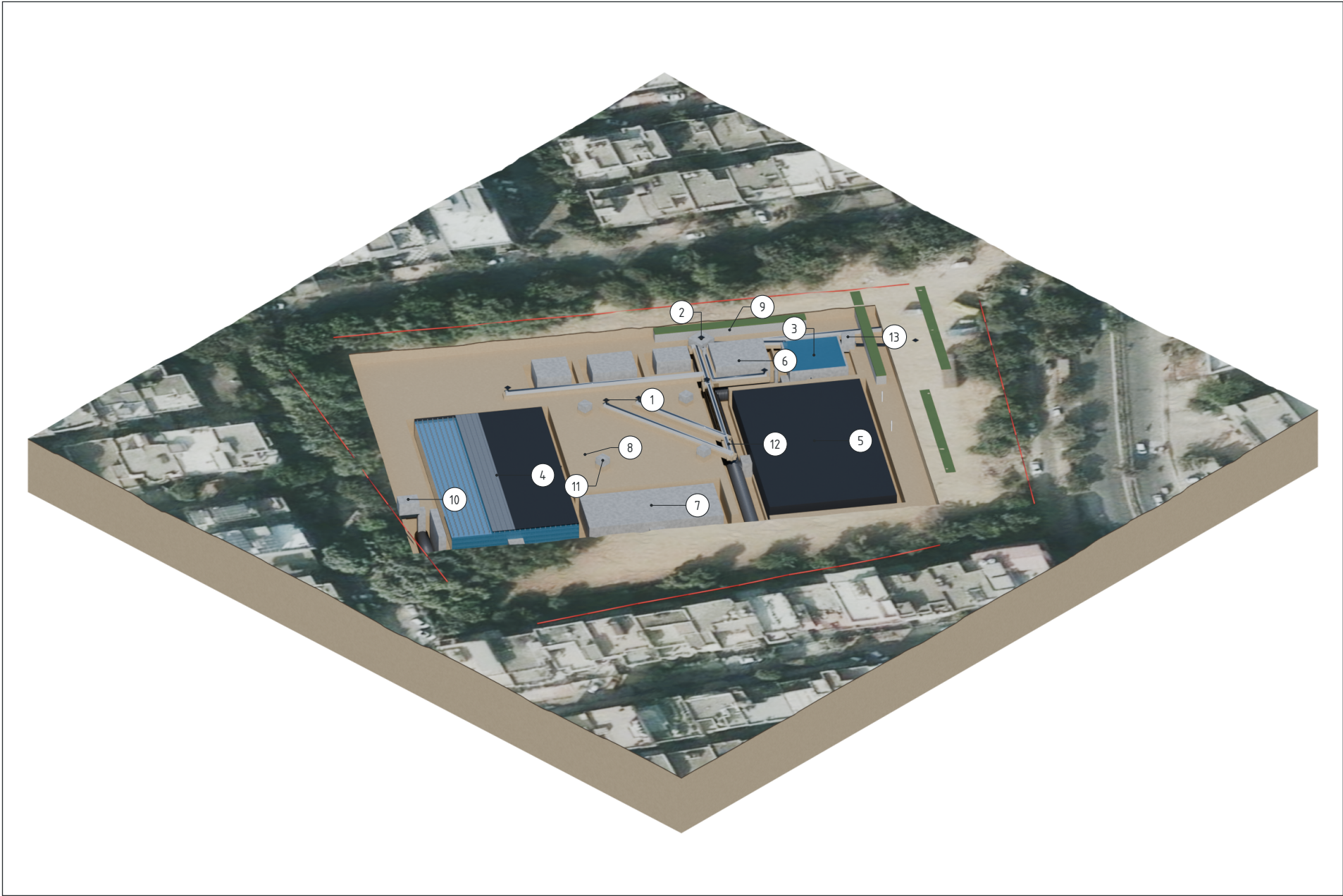
EVENT WATER BALANCE, STORAGE CAPACITY VERSUS SIMULATED FILL, FILLING TIMELINE, FLOW CHAIN AND RATE LIMITS

FLOODASTRA GURUGRAM | WATER BALANCE

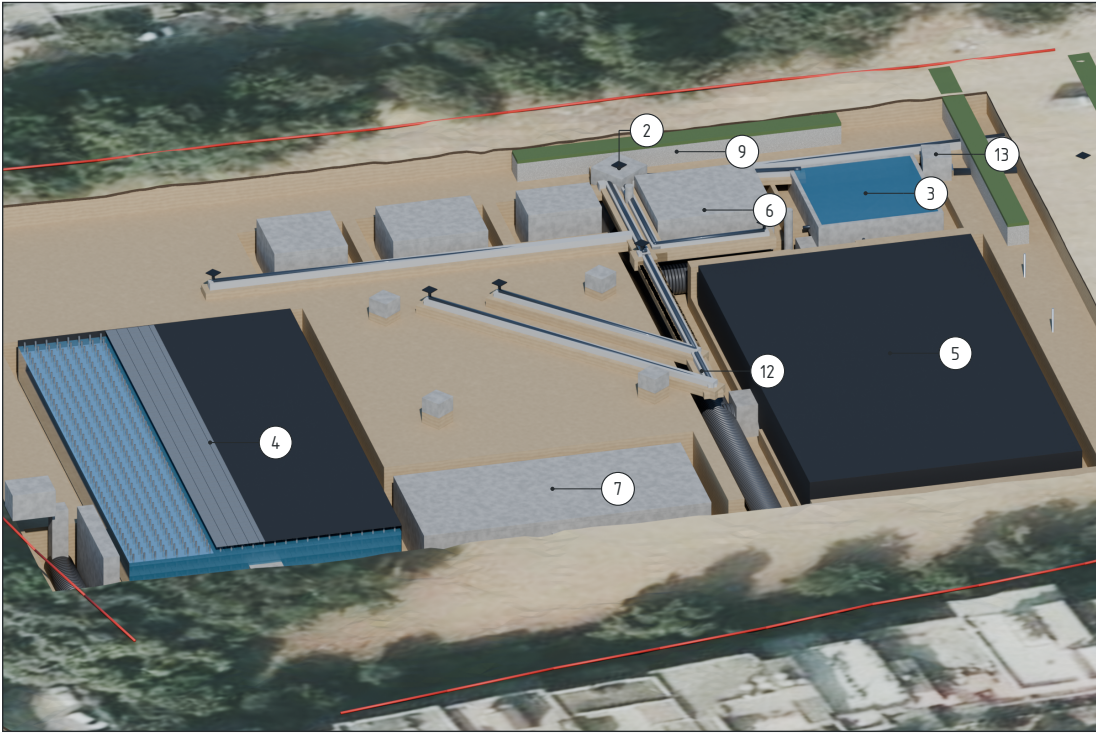
DWG No. FA-RL-04 | SHEET 4 OF 7
REV P3 | 18 OCT 2026 | STREET CAPTURE, PUMPING AND I&C
Charts and diagram not to scale | Sheet A1 | Levels: m
PROPOSED DESIGN - PRELIMINARY - NOT FOR CONSTRUCTION



A SECTION CUT-AWAY OF THE BURIED WORKS | GROUND AND COVER REMOVED OVER THE SCHEME (FINISHED SURFACE IS TURF, SEE FA-RL-01 ZONING)



B CLOSE CUT-AWAY: STORAGE FIELDS, FOREBAY AND PLANT ROOM



KEYED COMPONENTS

- 1 Pond inlet grate, flush and heel-proof (7 no.)
- 2 Collector sump with 3 m booster pump
- 3 Forebay + hydrodynamic separator 200 m³ (roof omitted)
- 4 Storage field SF-2, PP modules (geomembrane cut back to show grid)
- 5 Storage field SF-1, PP modules in black HDPE geomembrane
- 6 Buried plant room: filter, pumps, controls
- 7 Clean tank 1,000 m³, PP modules under cover
- 8 Injection well casing to 20 m screen (2 wells phase 1, 2 future)
- 9 Recharge trench with 2 shafts
- 10 Edge kiosk – only above-ground unit
- 11 Wellhead vault, flush and lockable
- 12 Inspection gallery IG-1 (future phase), DIA 2.4 m, floor 210.50
- 13 Overflow chamber OC-1, DN800 flap gate FG-1 (closed in design storm)

- Red line: Ram Lila Ground boundary (provisional, not cadastral)
- Green strips: recharge trenches (turf over gravel)

SURFACE USE OF RAM LILA GROUND (AREAS FROM FA-RL-01 ZONING)

ZONE AND USE DURING RAMLILA AND DAILY USE		m²	% GROUND
A PERMANENTLY UNUSABLE	Edge kiosk, gallery entry stair and hatch, vent stacks	30	0.2%
B KEEP CLEAR – NO FIXED STRUCTURES	Access and desilting hatches and risers with 3 m apron, wellhead vaults, maintenance route from the road	1,058	8.3%
C LOAD-LIMITED USE	Over storage fields, tanks, plant room and gallery: crowds, stage, light vehicles: no heavy cranes, piling or deep tent pegs	2,508	19.6%
D RECHARGE TRENCH STRIPS	Walkable turf; no vehicles	236	1.8%
E FULLY USABLE	Open ground, no restriction	8,937	70.0%
Total ground 12,769 m² (provisional boundary). Usable for events (C + D + E): 11,681 m² = 91%.			

VIEW NOTES

- 1. Views are rendered orthographically from the same 1 m terrain model, plan positions and levels used in the simulation and on drawings FA-RL-01 to 04. Vertical exaggeration 1.0.
- 2. Storage-field decks and tank roofs sit 1.3–1.6 m below ground with about 1 m of soil and turf above; plant-room depths (1.0–4.5 m below ground) are a design assumption for detailed design.
- 3. Injection well casings are truncated in the views; screens are at 87.6–67.6 m (about 130–150 m below ground), see FA-RL-02 detail E.
- 4. • Recharge trenches are an analytic proposal and were not part of the simulation.
- 5. Water shown in tanks is the simulated volume at 3.2 h from rain start.
- 6. Imagery: Esri, Vantor, Earthstar Geographics and GIS User Community, draped on the 1 m terrain model; vertical exaggeration 1.0; storage field SF-2 shown with geomembrane cut back to reveal the module grid.
- 7. Inspection gallery IG-1 (2.4 m corrugated pipe), its chambers, vents and entry stair are access provisions drawn from FA-RL-01; not part of the simulation.
- 8. PP column-and-deck storage modules and precast RCC roofs carry crowds and light vehicles through the cover, so the ground above the storage stays usable.



AIReSQ

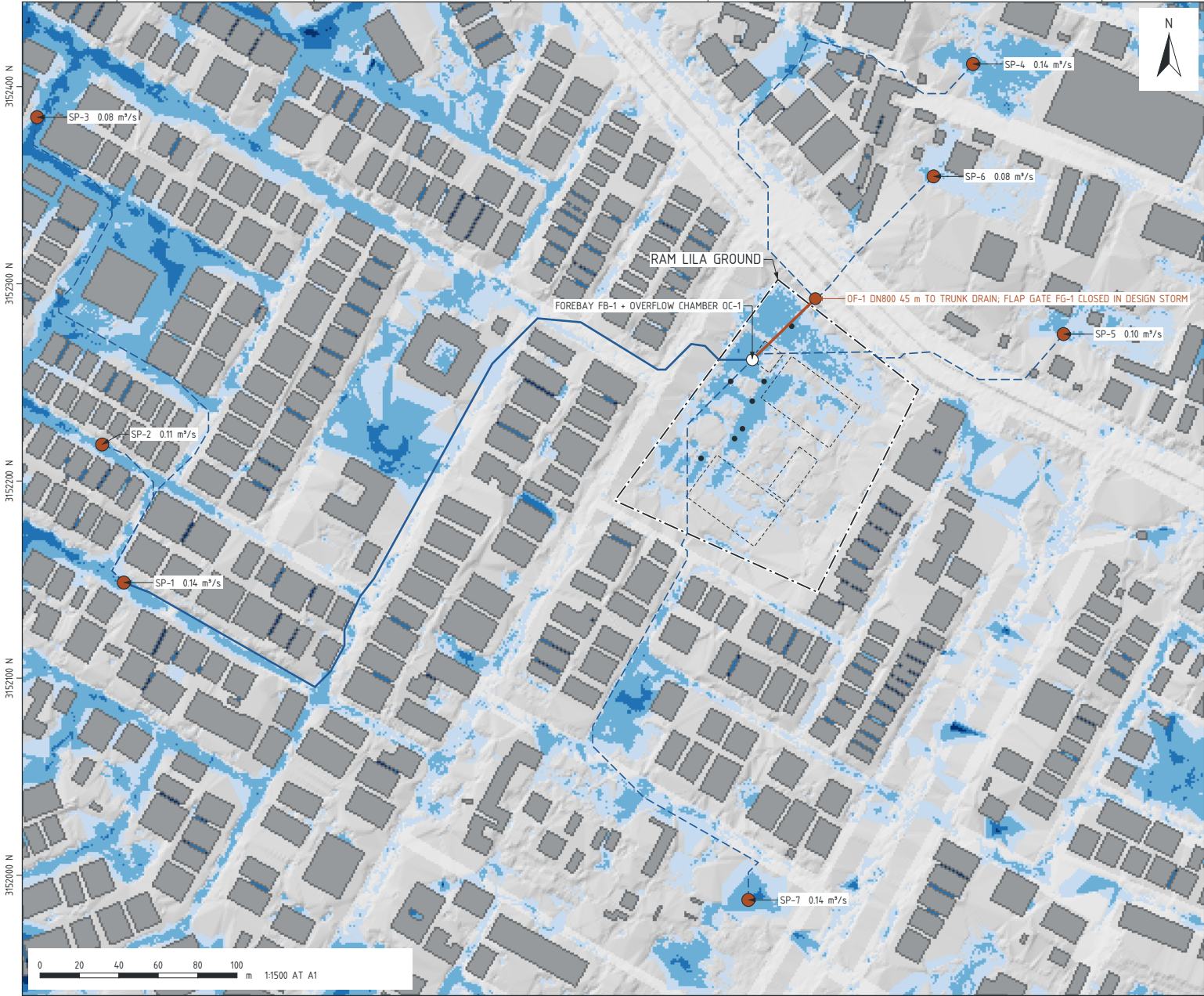


IIT Gandhinagar



MUNICIPAL CORPORATION OF GURUGRAM
NURTURING GURUGRAM

STREET PITS SP-1.7, RISING MAINS ALONG ROADS (blue; solid = NW trunk) AND OVERFLOW OF-1 (orange) | peak depth with the scheme shaded



Routes follow road corridors (least-cost path on the 1 m grid, buildings excluded); confirm against utilities survey. Trunk-drain position and invert to be confirmed by MCG.

PUMP SCHEDULE (DESIGN FLOW = 1.25 x SIMULATED PEAK)

TAG	DUTY	UNITS	RATING	POWER	BASIS
SP-1	Street pit, NW street pocket	1 duty + 1 standby submersible	0.14 m³/s @ 6 m	12 kW	simulated peak 0.11 m³/s, 773 m³
SP-2	Street pit, NW street pocket	1 duty + 1 standby submersible	0.11 m³/s @ 6 m	10 kW	simulated peak 0.09 m³/s, 593 m³
SP-3	Street pit, NW street pocket	1 duty + 1 standby submersible	0.08 m³/s @ 8 m	9 kW	simulated peak 0.06 m³/s, 295 m³
SP-4	Street pit, NE pocket	1 duty + 1 standby submersible	0.14 m³/s @ 5 m	10 kW	simulated peak 0.10 m³/s, 778 m³
SP-5	Street pit, E pocket	1 duty + 1 standby submersible	0.10 m³/s @ 5 m	8 kW	simulated peak 0.07 m³/s, 610 m³
SP-6	Street pit, NE near pocket	1 duty + 1 standby submersible	0.08 m³/s @ 4 m	5 kW	simulated peak 0.06 m³/s, 472 m³
SP-7	Street pit, S pocket	1 duty + 1 standby submersible	0.14 m³/s @ 5 m	11 kW	simulated peak 0.10 m³/s, 686 m³
PM-1	Intake booster at collector sump	2 duty + 1 standby	1.04 m³/s @ 3 m (1.2 m³/s free)	52 kW limit	simulated, DN700 main
TP-1,2	Treatment pumps, storage fields to filter	2 duty	2 x 25 L/s @ 12 m	2 x 3 kW	simulated
IB-1	Injection booster, clean tank to wells	1 duty + 1 standby	100 L/s @ 10 m	15 kW	simulated

RISING MAINS (HDPE PE100, <= 1.8 m/s)

TAG	FROM	TO	PIPE	LENGTH	FLOW	FRICTION
RM-2	SP-2	SP-1	DN355 HDPE PE100	96 m	0.11 m³/s	0.5 m
RM-3	SP-3	SP-1	DN315 HDPE PE100	342 m	0.08 m³/s	1.9 m
RM-NW	SP-1 (NW hub)	Forebay FB-1	DN560 HDPE PE100	481 m	0.33 m³/s	2.2 m
RM-4	SP-4	Forebay FB-1	DN400 HDPE PE100	311 m	0.14 m³/s	1.5 m
RM-5	SP-5	Forebay FB-1	DN315 HDPE PE100	179 m	0.10 m³/s	1.5 m
RM-6	SP-6	Forebay FB-1	DN315 HDPE PE100	132 m	0.08 m³/s	0.7 m
RM-7	SP-7	Forebay FB-1	DN400 HDPE PE100	362 m	0.14 m³/s	1.7 m
OF-1	Overflow chamber OC-1 (weir 215.94, flap gate FG-1)	MCG trunk storm drain (to confirm)	DN800 RCC NP3, gravity	45 m	1.04 m³/s	gravity

STREET-CAPTURE ADD-ON COST (CONCEPT, INR LAKH, +/-30 %, EXCL. GST)

ITEM	QUANTITY	INR LAKH
Street pits SP-1.7 (precast, grate, silt trap, valve chamber)	7 no.	42
Submersible pump sets, 1 duty + 1 standby per pit, with panels	14 no.	56
HDPE rising mains DN200-DN560, laid in road incl. reinstatement	1,903 m	285
Intake upgrade: DN700 main, 52 kW booster set (in place of DN500 / 26 kW)	lump sum	45
Overflow chamber OC-1 with DN800 flap gate FG-1 and outfall to trunk drain	45 m	26
Instrumentation, PLC, telemetry and CCTV	lump sum	55
TOTAL ADD-ON INR 510 lakh (about INR 5.1 crore)		

INSTRUMENTATION AND CONTROL (PLC IN EDGE KIOSK, TELEMETRY TO MCG DASHBOARD)

TAG	INSTRUMENT	LOCATION	QTY	FUNCTION
LT	Radar level transmitter	Each street pit, sump, forebay, SF-1, SF-2, filter feed, clean tank	13	Pump start/stop, high-level alarm, storage-full inlet shut
FT	Electromagnetic flow meter	DN700 main, each rising main, filter outlet, each well feed	13	Water balance; volume captured and injected per storm
AT-T	Turbidity analyser	Filter inlet and outlet	2	Injection stop if outlet > 5 NTU
AT-C	Conductivity / EC analyser	Filter outlet	1	Water-quality record before injection
PT	Pressure transducer (vented)	Each injection well and each observation well	6	Injection head and aquifer response; injection cut-back on high head
RG	Tipping-bucket rain gauge	Edge kiosk roof	1	Storm start; pumps on standby ahead of ponding
PLC	PLC with 4G/fibre telemetry	Edge kiosk	1	Interlocks, alarms, MCG dashboard
CCTV	Camera at grates and kiosk	Pond and each street pit	8	Blockage and safety checks

CONTROL INTERLOCKS AND BASIS

- Design assumption: downstream drains are full during the storm, so flap gate FG-1 on overflow OF-1 stays closed and no water leaves the plant (as simulated). When SF-1 and SF-2 reach top level (215.94) the street-pit and intake pumps stop. FG-1 stops trunk-drain water backing into the plant; OF-1 relieves the plant only after the trunk drain recedes.
- No injection unless filter outlet turbidity < 5 NTU and well head below the set limit.
- All pumps stop at low level (dry-run protection); check valves on every rising main prevent backflow to the street.
- Duty/standby rotation each storm; standby starts on duty-pump fault.
- Design flow = 1.25 x simulated 5-min peak per grate (intake allocated by the model opening law). Mains at <= 1.8 m/s, Hazen-Williams C = 140, routes along road corridors (least-cost path on the 1 m grid avoiding buildings), static lift 2.5 m. Costs are concept estimates (INR lakh, +/-30 %, excl. GST).

PROJECT / CLIENT

Ram Lila Ground, Sheetha Mata Mandir Road, Gurugram

Client: Municipal Corporation of Gurugram

Prepared by: IIT Gandhinagar with AIReSQ

WHAT THIS SHEET SHOWS

STREET PITS AND INDICATIVE RISING-MAIN ROUTES, PUMP AND MAIN SCHEDULES SIZED FROM THE SIMULATED FLOWS,

INSTRUMENTATION AND CONTROL

FLOODASTRA GURUGRAM | PUMPING AND I&C

DWG No. FA-RL-06 | SHEET 6 OF 7

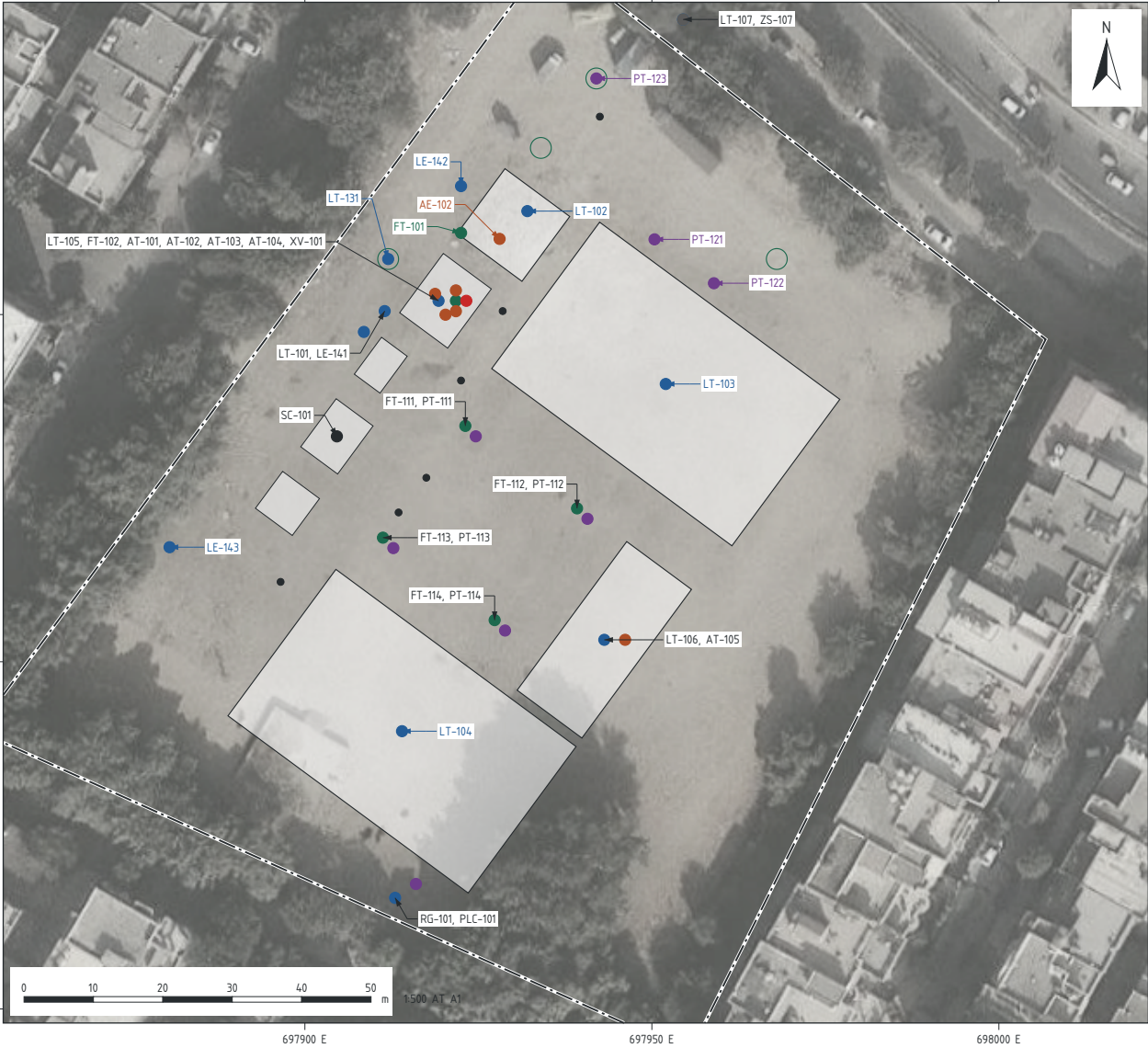
REV P3 | 18 OCT 2026 | STREET CAPTURE, PUMPING AND I&C

Scale 1:1500 (plan) | Sheet A1 | Levels: m

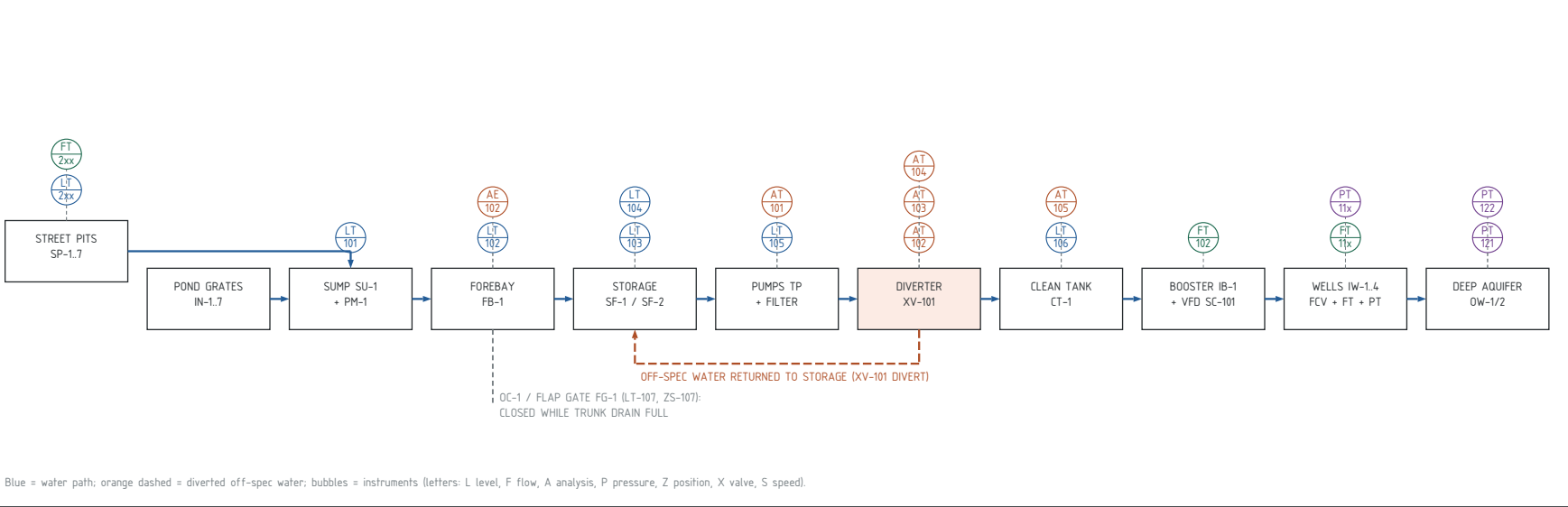
PROPOSED DESIGN - PRELIMINARY - NOT FOR CONSTRUCTION



A SENSOR LOCATION PLAN | 1:500 | street-pit sensors LT/FT-2xx on FA-RL-06



B PROCESS AND INSTRUMENTATION LINE DIAGRAM (SIMPLIFIED, NOT TO SCALE)



C INJECTION CONTROL STATES (PLC-101; INDICATIVE SETPOINTS, TO BE FIXED WITH CGWA AND THE INJECTION TEST)

STATE	TRIGGER (ALL FROM SENSORS ON THIS SHEET)	ACTION
1 STOP + DIVERT	AT-102 > 10 NTU, or oil (AT-104), or pH outside 6.5-8.5 / EC step (AT-103), or well head at limit (PT-11x)	Close FCV-111.114; XV-101 to storage; alarm to MCG control room
2 HOLD + RECIRCULATE	AT-102 5-10 NTU, or first 20-30 min of street runoff	No injection; settle in SF-1/2 or refilter
3 REDUCED RATE	Quality OK but well head rising fast (PT-11x) or mound near limit (PT-121/122)	Lower SC-101 speed; rest the affected well
4 NORMAL	AT-102 < 2-5 NTU, all parameters normal, head margin available	Inject at design rate through active wells
5 ACCELERATE	Quality good, head margin, storage > 60 % (LT-103/104) or rain forecast (RG-101)	Both trains; wells 3 and 4 on; raise SC-101 speed

D INSTRUMENT REGISTER (POSITIONS: UTM 43N, FROM THE DESIGN GEOMETRY)

TAG	INSTRUMENT	LOCATION	E / N	PURPOSE	SETPOINT / ALARM
LT-101	Radar level transmitter	Collector sump SU-1	697912 / 3152250	Booster PM-1 start/stop	start 215.94, stop 215.84, high 217.0
LT-102	Radar level transmitter	Forebay FB-1	697932 / 3152265	Forebay level, overflow watch	high 215.80
LT-103	Radar level transmitter	Storage field SF-1	697952 / 3152240	Fill state; storage-full stop	full 215.94; stop PM-1 and SP pumps
LT-104	Radar level transmitter	Storage field SF-2	697914 / 3152190	Fill state; storage-full stop	full 215.94; stop PM-1 and SP pumps
LT-105	Radar level transmitter	Filter feed chamber	697919 / 3152252	Treatment pumps TP-1/2 control	low-low: pumps off
LT-106	Radar level transmitter	Clean tank CT-1	697943 / 3152203	Injection booster IB-1 control	low: IB-1 off
LT-107	Level transmitter (pair)	Overflow OC-1, each side of FG-1	697954 / 3152292	Trunk-drain level; gate state check	downstream > upstream: gate closed
ZS-107	Gate position switch	Flap gate FG-1	697954 / 3152292	Gate open/closed record	alarm if open while drain full
AE-102	Sludge-blanket (silt) sensor	Forebay FB-1 sump	697928 / 3152261	Desilting trigger	silt > 0.5 m: desilt
FT-101	Electromagnetic flow meter	DN700 main GM-1	697923 / 3152262	Volume captured per storm	record
FT-102	Electromagnetic flow meter	Filter outlet	697922 / 3152252	Treated volume	record
AT-101	Turbidity analyser	Filter inlet	697919 / 3152253	Filter performance	record
AT-102	Turbidity analyser	Filter outlet (before XV-101)	697922 / 3152253	INJECTION PERMISSIVE	< 2 normal; 5-10 hold; > 10 stop
AT-103	EC + pH analyser	Filter outlet	697922 / 3152250	INJECTION PERMISSIVE	pH 6.5-8.5; EC step > 20 %: stop
AT-104	Oil-in-water detector	Filter outlet	697920 / 3152250	INJECTION PERMISSIVE	oil detected: stop
AT-105	UV254 organics probe	Clean tank CT-1 outlet	697946 / 3152203	Organics trend	trend alarm
XV-101	Automatic 3-way diversion valve	After filter: to CT-1 or back to SF	697923 / 3152252	Divert off-spec water	driven by AT-102.104
SC-101	VFD speed control	Injection booster IB-1	697905 / 3152232	Injection rate (reduce/accelerate)	by PT and storage level
FT-111	Flow meter + FCV-111	Well IW-1 feed	697923 / 3152234	Well rate; specific capacity	drop > 20 %: backflush

TAG	INSTRUMENT	LOCATION	E / N	PURPOSE	SETPOINT / ALARM
PT-111	Pressure transducer	Injection well IW-1	697925 / 3152232	Injection head	head limit: reduce/stop
FT-112	Flow meter + FCV-112	Well IW-2 feed	697939 / 3152222	Well rate; specific capacity	drop > 20 %: backflush
PT-112	Pressure transducer	Injection well IW-2	697941 / 3152221	Injection head	head limit: reduce/stop
FT-113	Flow meter + FCV-113	Well IW-3 feed	697911 / 3152218	Well rate; specific capacity	drop > 20 %: backflush
PT-113	Pressure transducer	Injection well IW-3	697913 / 3152216	Injection head	head limit: reduce/stop
FT-114	Flow meter + FCV-114	Well IW-4 feed	697927 / 3152206	Well rate; specific capacity	drop > 20 %: backflush
PT-114	Pressure transducer	Injection well IW-4	697929 / 3152204	Injection head	head limit: reduce/stop
PT-121	Piezometer logger (deep)	Observation well OW-1	697950 / 3152261	Aquifer mound and quality sampling	mound limit: reduce rate
PT-122	Piezometer logger (deep)	Observation well OW-2	697959 / 3152255	Aquifer mound and quality sampling	mound limit: reduce rate
PT-123	Piezometer logger (shallow)	Near RT-2	697942 / 3152284	Shallow groundwater rise	record
LT-131	Level logger	Recharge trench RT-1 shaft	697912 / 3152258	Trench drain-down rate	record
LE-141	Surface flood-depth sensor	Ground low point 1 (simulated. peak 0.91 m)	697908 / 3152248	Flood depth; scheme benefit	alert 0.15 m, 0.30 m
LE-142	Surface flood-depth sensor	Ground low point 2 (simulated. peak 0.80 m)	697922 / 3152268	Flood depth; scheme benefit	alert 0.15 m, 0.30 m
LE-143	Surface flood-depth sensor	Ground low point 3 (simulated. peak 0.77 m)	697880 / 3152216	Flood depth; scheme benefit	alert 0.15 m, 0.30 m
RG-101	Tipping-bucket rain gauge	Edge kiosk KI-1 roof	697913 / 3152166	Storm start: pre-start pumps	> 10 mm/h: pumps to standby
PLC-101	PLC + 4G/fibre telemetry + UPS	Edge kiosk KI-1	697916 / 3152168	Control, interlocks, MCG dashboard	all alarms
LT/FT-2xx	Level + flow per street pit	SP-1.7 and rising mains (see FA-RL-06)	see FA-RL-06	Pit pumps, captured volume	pit high/low
CCTV	Cameras (8)	Pond grates, FG-1, street pits	see FA-RL-06	Blockage and safety	operator

LEGEND AND NOTES

- Level / depth (LT, LE, AE silt)
- Flow (FT) with flow-control valve
- Water-quality analyser (AT)
- Pressure / piezometer (PT)
- Automatic valve (XV)
- Position switch (ZS)

ISA instrument bubble: letters / loop number

- Injection is permitted only when AT-102, AT-103 and AT-104 are all in range; otherwise XV-101 returns water to storage (fail-safe: valve defaults to divert on power or signal loss).
- All signals to PLC-101 in kiosk KI-1 with UPS; telemetry to the MCG dashboard; manual override with event log for audit.
- Baseline groundwater quality at OW-1/2 before construction, then each season and after each injection event (CGWA permission).
- Setpoints are indicative; final values from the injection test, filter trials and the CGWA approval.

PROJECT / CLIENT

Ram Lila Ground, Sheetha Mata Mandir Road, Gurugram

Client: Municipal Corporation of Gurugram

Prepared by: IIT Gandhinagar with AIReSQ

WHAT THIS SHEET SHOWS

SENSOR LOCATIONS, PROCESS AND INSTRUMENTATION LINE DIAGRAM, INJECTION CONTROL STATES AND INSTRUMENT REGISTER

FLOODASTRA GURUGRAM | INSTRUMENTATION

DWG No. FA-RL-07 | SHEET 7 OF 7

REV P3 | 18 OCT 2026 | STREET CAPTURE, PUMPING AND I&C

Scale 1:500 (plan) | Sheet A1 | Levels: m

PROPOSED DESIGN - PRELIMINARY - NOT FOR CONSTRUCTION