

# OPTIMIZED FLOOD CONTROL SOLUTIONS





**FLOODING FACTS:**

- \* NUMBER OF FLOODING OCCURRENCES HAS MORE THAN DOUBLED SINCE THE YEAR 2000
- \* 106 MILLION PEOPLE WERE AFFECTED BY FLOODING IN 2010
- \* COST OF FLOODING TO SOCIETY WAS USD 40 BILLION IN 2010

Source: EM-DAT: The OFDA/CRED – International Disaster Database [www.emdat.be](http://www.emdat.be) Université catholique de Louvain Brussels – Belgium

# EXPERTS IN FLOOD CONTROL PUMPING SOLUTIONS

✕ | Grundfos flood control installations worldwide

## Reliable solutions for stormwater and flooding

Flooding is not just the most common cause of natural disaster in the world; it is also by far the fastest growing. Some floods develop slowly, while others, such as flash floods, can develop in just a few minutes even without visible signs of rain. Some floods are local, impacting a neighborhood or community; others are very large, affecting entire river basins and multiple countries.

Flood control pumping is characterized by a requirement for high flow and low head. As many flood scenarios are seasonal, flood control pumps may only run occasionally, placing heavy demands on the reliability of the pumping solution.

As part of our dependable, energy-efficient flood control solutions, we supply a complete range of products optimized for high total efficiency and low maintenance costs. Applying our design and flow simulation competencies mean we can minimize the pumping station footprint, ensure safe pump operation and reduce the total cost of the pumping station.

## Global experience, local expertise

With our innovative and reliable flood control solutions, Grundfos goes further than most to prevent flooding in a financially and environmentally sustainable way. Our expertise can be applied to addressing the key issues of safeguarding people, crops, business, city and regional infrastructure.

As a pump manufacturer, our contribution to a flood control solution builds primarily upon the flood risk management strategy applied. Grundfos is at the forefront in promoting and facilitating energy efficiency and sustainable technology.

Grundfos is the world's largest pump manufacturer and a full line supplier of pump solutions within water supply, wastewater, building services and industry. With Grundfos companies in more than 55 countries and more than 250 Grundfos partners worldwide, we offer local expertise and support wherever you are. We support the planning, designing and commissioning of pumping systems, and we deliver the technology that meets your needs.



# KEEPING RELIABILITY HIGH AND DOWNTIME LOW

Grundfos offers a wide range of flood control solutions – from small solutions for private households to large-scale solutions that protect large cities. Our solutions take account of the factors that typically are part of a flood risk management strategy.

## STEP 1 Preventive flood risk management



Our contribution to flood defense extends from household drainage to large scale management of water flows from network, main and extremely large pumping stations. We support the design and project management processes, from the planning to the execution and commissioning of systems and solutions.

## STEP 2 Flood event management



Grundfos has developed operational solutions and services to handle flooding scenarios and improve reliability, including the operation of installations, service products, preventive maintenance, preparedness of installations and control and monitoring solutions for status and alarm functions.

## STEP 3 Post-flood measures



Immediately after a flood, a community faces great challenges. The population is at risk, as drinking water supplies may be polluted. To get the infrastructure back on track, sewage must be removed and entire areas cleaned up. Grundfos supplies portable pump solutions to get excess water pumped away and stationary and mobile disinfection solutions to maintain a drinking water supply.

### Pump Gate

Used where space is limited, the Grundfos solution combines a flood gate and pumps. When equipped with submersible pumps, the gates can be installed on an existing waterway. The need for a reservoir and pumping station is eliminated.



### Drain/rain water station

For collecting excess water and pumping it away, Grundfos offers pump systems and prefabricated pumping stations with integrated controls. These solutions offer great reliability and the benefits of continual surveillance and alarms.

### Storm water retention tank

Stores excess stormwater and rainwater runoff temporarily to avoid hydraulic overload of the sewer system to reduce peak flow and equalize flow rates. Grundfos supplies all pumps, mixers, controls and other equipment for the storm water tank for the better utilization of the existing sewer system, the intelligent management of storm water flows and savings on infrastructural investments.

### Flood control pumping station

Grundfos equips a solution that offers high reliability and can prevent large areas from flooding. Such installations move extremely large amounts of water flowing in open canals and can be equipped with a water gate to the sea.



# DELIVERING YOUR PROJECT ON TIME

We support our partners during the design phase and with project management when planning, executing and commissioning flood control systems and solutions. Grundfos invests substantially more money in research and technology development than any other pump company and our innovative efforts result in optimized solutions for the customer.

### Project execution an area of expertise

Grundfos has established a global Water Utility competency network, to ensure that complex projects get the expertise they require. In direct cooperation with local expertise in markets around the world, one of the key functions of our competency network is to provide an optimized project execution, ensuring deliveries at all stages of the project are timely, correct and within budget.

We apply advanced solution tools for designing and validating flood control system designs, for example model testing and Computational Fluid Dynamics (CFD). Worldwide test facilities geared to the precise applications for which our pump systems are manufactured and a global focus on procurement,

manufacturing and distribution, all contribute to the delivery of your optimized flood control solution – on time and within budget.

### Global reach and supply chain

We are focused on where to produce and where to stock to ensure the highest flexibility, the best possible lead times, and that your operations are constantly optimized and to reduce costly downtime.

Our global logistics and distribution setup ensure rapid supply and installation of pumps and equipment. We have dedicated warehouses for spare parts and aftermarket products to ensure fast and efficient supply.

We are a trusted partner for consultants, contractors and water utilities that are looking for security, flexibility and reliability for their flood control solution from a full-line supplier.

### Grundfos service and solutions

Grundfos service includes commissioning, repair and maintenance solutions that prevent breakdowns or rectify problems quickly and professionally. Remote monitoring solutions enable 24/7 management of pump installations, making preventive maintenance possible.

### Handbooks and guidelines available

Grundfos offers consultancy on every aspect of the flood control solution, and this is knowledge we are happy to share. Our handbooks for the design and optimization of storm water tanks and for designing flood control pumping stations are available for order or download from our website

[www.grundfos.com/flood-control](http://www.grundfos.com/flood-control)





# SOLUTIONS TAILORED TO **GEOGRAPHY AND CLIMATE**

Regions all over the world are affected by flooding, with large, coastal cities most at risk. Indeed, any region or city faced with high annual rainfalls, increased populations and expanding urban areas will be called upon to place increasingly great focus on flood control.

From building new flood control infrastructure in cities on flood plains or river deltas to cities having to upgrade existing flood control installations and adapt these to changing weather patterns following climate change, Grundfos has the local knowledge, experience and innovative solutions to meet these challenges.



# KEEPING LARGE FLOWS MOVING ON NEW STORM WATER LINE BUDAPEST, HUNGARY

The new Ferencváros Pumping Station is a part of a huge environmental protection investment in Budapest focusing on the Central Wastewater Treatment Plant construction, the collection system and mains construction, and pumping stations that cross the River Danube. To ensure that all wastewater passes through treatment processes even in heavy rain or surface flooding events, a bypass storm water line was required.

In 2010, the new pumping station was constructed with the separate storm water line. The solution presented by Grundfos included 10 vertically-installed submersible axial flow storm water pumps. These 489 HP [365 kW] pumps are capable of pumping 47,836 US gpm [3,018 liters] per second at 31.5 ft [9.6 meters] head. This type of application with its special design and using very large pumps was unique in Hungary and Grundfos worked closely with the designers, the construction company and the operators.

Grundfos supplied:

- Pre-sales consultancy
- KPL submersible axial flow storm water pumps
- Supervision of installation
- Resolution of all issues prior to commissioning
- Commissioning of the pumping system







## INNOVATIVE PUMP GATES REDUCE FLOOD RISK POGLAR, INDONESIA



In Poglar, Indonesia, Grundfos has installed a new innovative solution combining floodgates and axial flow pumps on an existing waterway. The Pump Gate protects the local community from flooding without the traditional space requirements for a pumping station and offering very easy operation and maintenance.

Three gates and six pumps have been installed at Poglar. The waterway where the Pump Gate is installed has a channel width of 39.4 ft [12 m] and a height of 13.1 ft [4 m]. Under normal conditions, water levels varied from a low of 21.2 ft [0.6 m] to a high of 102.4 ft [2.5 m]. Installed are six submersible axial flow propeller storm water pumps capable of 26.42 gpm [6 m<sup>3</sup>/h] flow and 13.78 ft [4.2 m] head.

Grundfos Indonesia supplied:

- Consultancy with local partners
- Submersible axial flow storm water pumps
- Supervision of installation
- Resolution of all issues prior to commissioning
- Commissioning of the Pump Gate



## FLOOD CONTROL PUMPING STATION PROTECTS LOW LYING AREAS CENTRAL MUMBAI, INDIA



Each year, the city of Mumbai faces flood risks from the monsoon rains. Flooding in low-lying areas is made worse when the tide is high. Grundfos has developed a comprehensive flood control solution, IRLA, in central Mumbai, with a flood gate that can be closed when tidal pressure is high, and where storm water is led to a dedicated flood control pumping station with eight 500 kW KPL axial flow pumps that handle flows up to 95,102 gpm [6m<sup>3</sup>/second] at 19.7 ft [6m] head per pump. See the film about IRLA at [www.grundfos.com/flood-control](http://www.grundfos.com/flood-control)

Grundfos supplied:

- Consultancy for the design of the inlet structure and tidal gates
- KPL submersible axial flow storm water pumps
- Comprehensive electro-mechanical solution with pumps, software, control panels and SCADA
- Support to local operations and maintenance contractor
- Commissioning of the flood control pumping station



## ROAD DRAINAGE FOR THE HARRIS COUNTY HIGHWAY SYSTEM TEXAS, USA



Grundfos installed three KPL axial flow submersible propeller pumps in a new flood control storm water pumping station that was built as part of the Harris County Highway System in Pasadena, Texas. The duty conditions for the 36" (900mm) 120hp (90kW) KPL pumps are 14,000 gpm (880 l/s) with a maximum head of 20 ft (6m). In addition, three pump sets with column pipes, controls and sensor modules were supplied.

Grundfos supplied:

- KPL submersible axial flow storm water pumps
- Three pump sets with draft tube columns, controls and sensor modules
- Pre-sales consultancy
- Pumping station design
- Supervision of installation
- Commissioning



# OPTIMISED PUMPING SOLUTIONS AND SYSTEMS

Flood control pumping is characterised by a requirement for pump solutions with high flow and low head. Grundfos supplies a full range of flood control pump solutions that are versatile, reliable and easy to use in a wide range of installations.

With the right data available, we can optimise the pump solution according to your exact demands and specific installation.

## POWERFUL PUMPS FOR HEAVY FLOWS

The powerful Grundfos range of axial flow, mixed flow and vertical turbine pumps for flood control are specifically designed for durable use in pumping stations, harbor management and storm water tank solutions.

### AXIAL FLOW PROPELLER PUMP – KPL

Axial flow propeller pump designed for the high flow at low head requirements of flood control and other similar duty applications. The Turbulence Optimiser™ (patent pending) reduces turbulence in the gap between the pump volute and the column pipe, increasing efficiency by up to two percentage points.

#### TECHNICAL DATA

- Motor size: 15-1072 HP (11-800 kW)
- Flow rate (Q): Maximum 145,822 gpm [43,319 yd<sup>3</sup>/h] (9,200 l/s [33,120 m<sup>3</sup>/h])
- Head (H): Maximum 32.8 ft (10 m)
- Liquid temperature: 32 to 104° F (0 to +40° C)
- Discharge diameter: Up to 86.6 in (2,200 mm)
- Insulation class: F
- Maximum installation depth: 65.6 ft (20 m)
- Maximum hydraulic efficiency: 87%

### MIXED FLOW PUMP – KWM

Mixed flow pump designed for the high flow at low head requirements of flood control and other heavy-duty pumping applications.

#### TECHNICAL DATA

- Motor size: 15-1072 HP (11-800 kW)
- Flow rate (Q): Maximum 118,877 gpm [35,315 yd<sup>3</sup>/h] (7,500 l/s [27,000 m<sup>3</sup>/h])
- Head (H): Maximum 131 ft (40 m)
- Liquid temperature: 32 to 104° F (0 to +40° C)
- Discharge diameter: Up to 86.6 in (2,200 mm)
- Insulation class: F
- Maximum installation depth: 65.6 ft (20 m)
- Maximum hydraulic efficiency: 85%

### VERTICAL TURBINE PUMP – VTP

Axial flow and mixed flow vertical turbine pumps for large volume pumping of water, available in material variants to suit the application and pumped liquid.

#### TECHNICAL DATA

- Motor size: Up to 5,000 HP (3,730 kW)
- Flow rate (Q): Maximum 220,000 gpm [65,354 yd<sup>3</sup>/h] (13,879 l/s [50,000 m<sup>3</sup>/h])
- Head (H): Maximum 100 ft (30 m)
- Liquid temperature: 32 to 140° F (0 to +60° C)

### SUBMERSIBLE WASTEWATER PUMPS – S RANGE

Highly dependable, powerful sewage pumps, designed for handling large flows, acknowledged for their strength, their durability and for innovative features such as SmartTrim impeller clearance adjustment system and SmartSeal for leakage prevention.

#### TECHNICAL DATA

- Motor size: Up to 697 HP (520 kW)
- Flow rate (Q): Maximum 2,500 l/s (9,000 m<sup>3</sup>/h)
- Head (H): Maximum 381 ft (116 m)
- Liquid temperature: 32 to 104° F (0 to +40° C)
- Discharge diameter: 3.15 to 23.6 in (80 to 600 mm)
- Free passage: Up to 5.71 in (145 mm)
- Insulation class: F (H on request)
- Maximum system pressure: PN 10
- Maximum hydraulic efficiency: 85%



# KEEPING WASTEWATER AND STORM WATER MOVING

For collecting and transporting flood water, keeping it moving in the tank, and then emptying the tank, Grundfos supplies rugged and versatile pumps, recirculators and Flushjets WA/WW. These pumps are enclosed units with a pump and motor, making them suitable for submersible operation, and they can also be dry-installed horizontally or vertically and are designed for durable use in pumping stations, harbor management and storm water tank solutions.



## SUBMERSIBLE WASTEWATER PUMPS – SE/SL

Designed for solids handling and flood water. The pumps can be installed submerged and/or dry.

### TECHNICAL DATA

- Motor size: 1 to 40 HP (0.9 to 30 kW)
- Flow rate (Q): Maximum 4,438 gpm [1,318 yd³/h] (280 l/s [1,008 m³/h])
- Head (H): Maximum 234 ft (71.3 m)
- Liquid temperature: 32 to 104° F (0 to +40° C)
- Discharge diameter: DN 65 to DN 300
- Free passage: Up to 6.30 in (160 mm)
- Insulation class: H
- Maximum efficiency: 88%
- Maximum system pressure: PN10

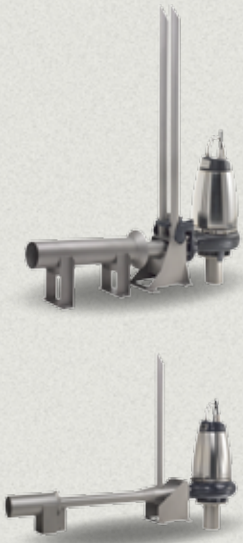


## SUBMERSIBLE RECIRCULATION PUMPS – SRP

Submersible recirculation pumps to handle large flows with low heads that are equally suitable for wastewater treatment plants and flood control. The triple sealing system ensures maximum protection of the mechanical shaft seal, and the bracket makes installation very easy.

### TECHNICAL DATA

- Motor size: 1 to 32 HP (0.8-24 kW)
- Flow rate (Q): Maximum 21,794 gpm [6,474 yd³/h] (1,375 l/sec [4,950 m³/h])
- Head (H): Maximum 6.89 ft (2.1 m)
- Liquid temperature: 41 to 104° F (5 to 40 °C)
- Discharge diameter: 11.8-31.5 in (300-800 mm)
- Insulation class: F
- Maximum hydraulic efficiency: 68%



## HYDRO EJECTORS FLUSHJET – WA/WW

The FlushJet is a hydro ejector designed to automatically clean tanks used for the temporary storage of storm water or wastewater so that odor problems are avoided and storage capacity is maintained. The FlushJet is made entirely of stainless steel of AISI 304/DIN1.4301 or AISI 316/DIN 1.4401, and is coupled to a SE or S wastewater pump.

No matter what the size and layout, a customized solution of one or more FlushJets can easily be designed to clean retention, equalization or storm water tanks used for the storage of excess water.

# RELIABLE AND VERSATILE DEWATERING PUMPS

Grundfos offers a complete range of transportable and submersible pumps for dewatering, offering reliability and energy efficiency. These pumps are also enclosed units that are suitable for submersible operation and dry-installation horizontally or vertically.



## HEAVY-DUTY DEWATERING PUMPS – DWK

Transportable pumps for dewatering of flood water, designed with semi-open or enclosed impeller. Made of corrosion-resistant materials such as cast iron and high-chrome stainless steel, for harsh environments.

### TECHNICAL DATA

- Motor size: 1-120 HP (0.75-90 kW)
- Flow rate (Q): Maximum 1902 gpm [565 yd³/h] (120 l/s [432 m³/h])
- Head (H): Maximum 292 ft (89 m)
- Liquid temperature: 32 to 104° F (0 to +40° C)
- Discharge diameter: 2-6 in (51-152 mm)
- Free passage: Strainer
- Insulation class: F
- Maximum hydraulic efficiency: 75%

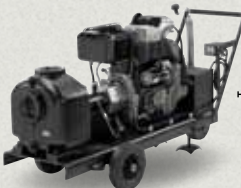


## CONTRACTOR PUMPS – DW

Transportable pumps for the dewatering of flood water. The aluminum materials for the main parts contribute to a light weight construction.

### TECHNICAL DATA

- Motor size: .94-27 HP (0.7-20 kW)
- Flow rate (Q): Maximum 1,315 gpm [391 yd³/h] (83 l/s [300 m³/h])
- Head (H): Maximum 322 ft (98 m)
- Liquid temperature: 32 to 104° F (0 to +40° C)
- Discharge diameter: 2-6 in (51-152 mm)
- Free passage: Strainer
- Insulation class: F
- Maximum hydraulic efficiency: 55%



## PORTABLE SELF-PRIMING PUMP – POMONA

Self-priming pumps for the emergency dewatering of flood water. High wear-resistance ensures long life-time and trouble free operation and a choice of motors (electrical or diesel) ensures mobility and low running cost.

### TECHNICAL DATA

- Motor size: .94-5.62 HP (0.7-4.2 kW)
- Flow rate (Q): Maximum 572 gpm 170 yd³/h] (36.1 l/s [130 m³/h])
- Head (H): Maximum 103 ft (31.3 m)
- Liquid temperature:
- Discharge diameter: DN100
- Free passage: 9.84 to 98.4 ft (3 to 30 mm)
- Insulation class: IP 55
- Max system pressure: PN6
- Maximum hydraulic efficiency: overall efficiency 53%



# CONTROLS AND MONITORING FOR FLOOD CONTROL

Grundfos supplies dedicated communication modules and controls for a range of water utility applications including flood control, ensuring trouble-free and continuous operation of complex pumping solutions. Open communication protocols and control and monitoring options with data collection options are all fully compatible with your SCADA system.



## REMOTE MANAGEMENT – GRM

Grundfos Remote Management is a cost-effective and straightforward way to monitor and manage pump installations in a range of applications including flood control. It reduces the need for onsite inspections and in the event of an alarm or warning, the relevant people are notified directly.

### COMMUNICATION:

- CIU271 communication interface enables data transmission via GPRS/SMS from Grundfos pumps and controllers
- Built-in multi-purpose I/O board allows the connection of sensors and switches
- A fixed low fee covers data traffic, hosting costs and system support, including back-up of all data

## WASTEWATER CONTROLS – DEDICATED CONTROLS

Control up to six pumps in flood control applications in main, network and pressurized pumping stations. A range of advanced features allow for system measurement and calculation and integration with other monitoring, control and energy optimizing equipment.

### COMMUNICATION:

- Supports communication with monitoring equipment or other external units using the Communication Interface Module (CIM) via a number of different fieldbus protocols
- Compatible with Grundfos Remote Management
- Communication using wired or wireless (GPRS/GSM) networks to SCADA systems



## FREQUENCY CONVERTERS – CUE

A complete range of external frequency converters designed for speed control of a wide range of Grundfos pumps for water utility applications including flood control. A special start-up guide will lead you through the set-up of the CUE.

### COMMUNICATION:

- Supports communication with monitoring equipment or other external units via a number of different fieldbus protocols using the Communication Interface Unit (CIU)
- Compatible with Grundfos Remote Management

### COMPONENTS

- Additional functions available that for example provide better application support and system optimization
- Additional analog input/output board, providing for additional inputs, for example temperature sensors for monitoring bearings
- A range of motor filters available
- MP 204 motor protection



## MOTOR PROTECTION UNIT – MP 204

Reliable, easy to set up and easy to use motor protection for all Grundfos pumps and applications, for motors ranging from 3 to 999 amps and voltages from 100 to 480 VAC that protects pump motors against undervoltage, overvoltage and other variations in power supply and overheating.

### COMMUNICATION:

- Supports communication with monitoring equipment or other external units via a number of different fieldbus protocols using the Communication Interface Unit (CIU)
- Compatible with Grundfos Remote Management
- Connect to any SCADA system, allowing remote access to pump data anywhere

### COMPONENTS

- The Control MP204 cabinet is also available with DOL (Direct on-line), SD (Star delta) and SS (Soft starter) starting methods



## INPUT/OUTPUT MODULE – IO 113

The IO 113 forms an interface between a Grundfos flood control pump with analogue and digital sensors and the pump controller. The most important sensor status is indicated on the front panel. One pump can be connected to an IO 113 module. Together with the sensors, the IO 113 forms a galvanic separation between the motor voltage in the pump and the controller connected.

### TECHNICAL DATA

- Supply voltage: 24 VAC  $\pm 10\%$ , 50 & 60 Hz 24 VDC  $\pm 10\%$
- Supply current: Min. 2.4 A; max. 8 A
- Power consumption: Max. 5 W
- Ambient temperature: -13° F to 149° F (-25°C to +65°C)
- Enclosure class: IP 20



### **Grundfos Water Utility – optimized water solutions**

Grundfos Water Utility is a full-range supplier of intelligent pumps and systems for all water supply and wastewater applications. We optimize pumping solutions to provide maximum reliability and resource efficiency for our customers. Our solutions are made with tried and tested technology and our expertise is part of any delivery.

### **We offer solutions and expertise within the following applications:**

- **RAW WATER INTAKE**
- **DRINKING WATER TREATMENT**
- **WATER DISTRIBUTION**
- **WASTEWATER TRANSPORT**
- **FLOOD CONTROL**
- **WASTEWATER TREATMENT**

For more information, please visit:  
**[grundfos.com/flood-control](http://grundfos.com/flood-control)**