The result of these actions are the being observed in the recent years rapid freshets occurring with increased frequency and characterized by higher culmination flows, thus causing serious threat to road facilities and hydraulic engineering structures, alike.

In the article there is analysis of meaning un-porous indicator for pick of runoff hydrograph. Field studies are concentrated in the summer time when rainfall is most intense in Poland. At this time they are installed divers – water level loggers, which permanently measuring the level of water in small rivers of Poznań. Resolution of loggers amounted 0,41cm and time response 10 minutes.

Aim of this article is to present the changes of water level as due to heavy rainfall in the urban area of Poznan and comparison with parameters that may have a key role in the occurrence of flash floods. The most important parameters by Bryndal (2010) are Catchment Area, Average lengths of streams, Basin circularity, Average channel slope, Drainage Network Density, Bifurcation index and parameters concerning land use. These data will be combined with precipitation measured with 6 hour time responce (Ławica Airport, Institute of Meteorology and Water Management – National Research Institute). These studies can give the answer what is the indirect cause of the formation of flash and urban floods in the city of Poznań (Kaniecki, 2013; Graf, 2014).

FLASH FLOOD MONITORING WITH USE OF VOLUNTEERED GEOGRAPHIC INFORMATION ON THE EXAMPLE OF POZNAŃ

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Flash and urban floods are characterized by a short time and local range. Their direct cause are heavy rains, especially in combination with large slopes and land use in urban areas. Poznań is a city where intensive urbanization leads to a reduction of the biologically active surfaces. This phenomenon can be observed both in the center and on the outskirts of the city. Impervious areas are rarely replaced by parks, squares and other green infrastructure elements, which leads to the acceleration of surface runoff and consequently flash flooding. Collecting accurate data about the places and the nature of the occurrence of such phenomena will allow you to in the long term understanding the regularities and prevention such phenomenas. Flash floods are particularly difficult to observation and measurement on the because of short duration. Information on this subject can give observation of the entire

area of the city and the continuous nature of the observation (Dąbkowski et al., 2009; Kanieck, 2013; Bryndal, 2014; Pociask-Karteczka and Żychowski, 2014; Graf, 2014).

Volunteered Geographic Information (VGI) is a method of observation performed by a group of observers without the use of measuring equipment. This method has been criticized because of the unprofessional approach of researchers, the subjectivity of the evaluation and the possibility of making conscious and unconscious errors. Its advantages are low operating costs and a wide range of spatial observation. It is used primarily to support a different measurement system, based on professional research equipment (Goodchild, 2007; Parker et al., 2013).

In the Project (website: www.hydrolog-flashflood.home.amu.edu.pl) measurement system takes into network of divers – water lever loggers, which are located on small rivers in Poznań at risk of flooding. Resolution of the loggers is 0,41cm and time response amounts 10 minutes. These measurements not including areas out of rivers, especially sewers. Therefore they are supplemented by reports from two groups of volunteers: amateur and semi-professional. The group of semi-professional consists of observers who are education geographical, aware of the phenomenon and such dangers. They got special training and are informed of the possibility of the phenomenon. A group of amateur using an online PHP script which only include information about the time and location of the phenomenon. It was also established cooperation with several local companies and institutions for mutual exchange of information. This data includes the location of broken sewers. In these cooperation participating municipal water supply, the State Fire Service, local utilities and transport companies communicate using Radio. This combination of methods of observation and measurement gives results of large range data.

Flash and urban floods are very dynamic phenomenas, so very often pose difficulties researchers. Therefore, it is necessary to broaden the scope of spatial information collected outside the hot spots. Using volunteers becomes that much more important that they can relate to inefficient municipal sewers, rivers or sections that are not covered by the standard methods of observation, especially in an urban environment where there is potentially a lot of observers (Pociask-Karteczka and Żychowski, 2014; Parker et al., 2013; Jawgiel, 2015).

Poster presents a complex structure of monitoring system of flash flood in the city of Poznań with a variety of data sources. The work presents the basic findings in terms of the potential the VGI of flash- and urban flood studies. Although the observations are burdened with large social subjectivity of observers, these data are becomes accepted by scientists. Functioning of the

service is described in a way that allows its reproduction in next works. It is obvious that the observations made macroscopically can not replace measurements using modern equipment and the data will not be as detailed and credible. That is why it is important the right calculating of materiality level and confidence interval. A good practice is to standardize the data from volunteers in relation to measurement data, eg. to develop a questionnaire that consisted exclusively of closed questions whose answers can be easy applied to measurement data.

ГЕОХИМИЧЕСКАЯ УСТОЙЧИВОСТЬ ЭКОСИСТЕМ РЕЗЕРВУАРОВ ОЗЕРА БАЙКАЛ К ТЕХНОГЕННОМУ ЗАГРЯЗНЕНИЮ

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Установлена геохимическая устойчивость экосистем каждого резервуара оз. Байкал при попадании химических элементов и органического вещества в озеро с техногенным стоком (таблица).

Таблица. Классы экологической опасности компонентов и прогноз их поведения в резервуарах в случае воздействия антропогенной нагрузки на оз. Байкал

Компоненты	Южный резервуар	Селенгинский	Средний	Ушканье-островский	Северный
K^+	У Д III	У ВД II	У ВД II	У ВД II	С ВД I
Na^+	У Д III	У Д III	У ВД II	У ВД II	У ВД II
Ca^{2+}	Л IV	Л IV	У Д III	Л IV	У ВД II
Mg^{2+}	У ВД II	У Д III	У ВД II	У ВД II	У ВД II
Al	С ВД I	С Д III	С ВД I	С ВД I	С ВД I
Si	С ВД I	С Д III	С ВД I	С ВД I	С ВД I
Mn^{2+}	С В I	У ВД II	С ВД I	С ВД I	С ВД I
$Fe_{общ}$	С ВД I	У ВД II	С ВД I	С ВД I	С ВД I
SO_4^{2-}	Л IV	Л IV	Л IV	Л IV	Л IV
HCO_3^-	Л IV	Л IV	Л IV	Л IV	Л IV
Cl^-	Л IV	Л IV	Л IV	Л IV	Л IV
NO_3^-	С ВД I	У Д III	С ВД I	С ВД I	С ВД I
PO_4^{3-}	С ВД I	У ВД II	С ВД I	С ВД I	С ВД I
As	С ВД I	У ВД II	С ВД I	С ВД I	С ВД I
B	Л IV	Л IV	У ВД II	Л IV	У В II